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ELECTRICAL WORLD

JANUARY 23, 1932
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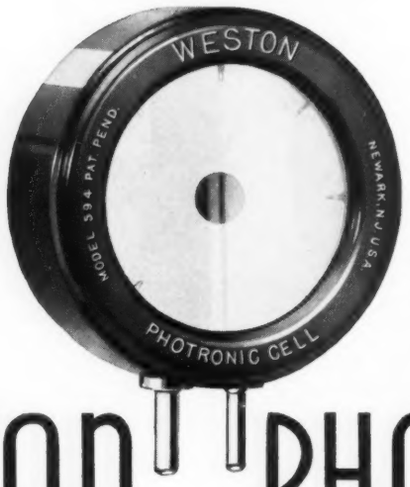

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A consolidation of Electrical World, Electrical Engineer and American Electrician

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JANUARY 23, 1932

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McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.
CHICAGO, 520 N. Michigan Ave. 883 Mission St., SAN FRANCISCO Aldwych House, Aldwych, LONDON, W.C. 2

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Published weekly. $5 per year. 25 cents per copy. Foreign, $9 U. S. currency, or 45 shillings, per year. Canada subscription price (including Canadian duty), $7.50. Entered as second-class matter, January 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

CABLE ADDRESS: "MCGRAWHILL, N.Y."

Member A.B.P. *Member A.B.C.*

NUMBER OF COPIES PRINTED THIS ISSUE, 16,850

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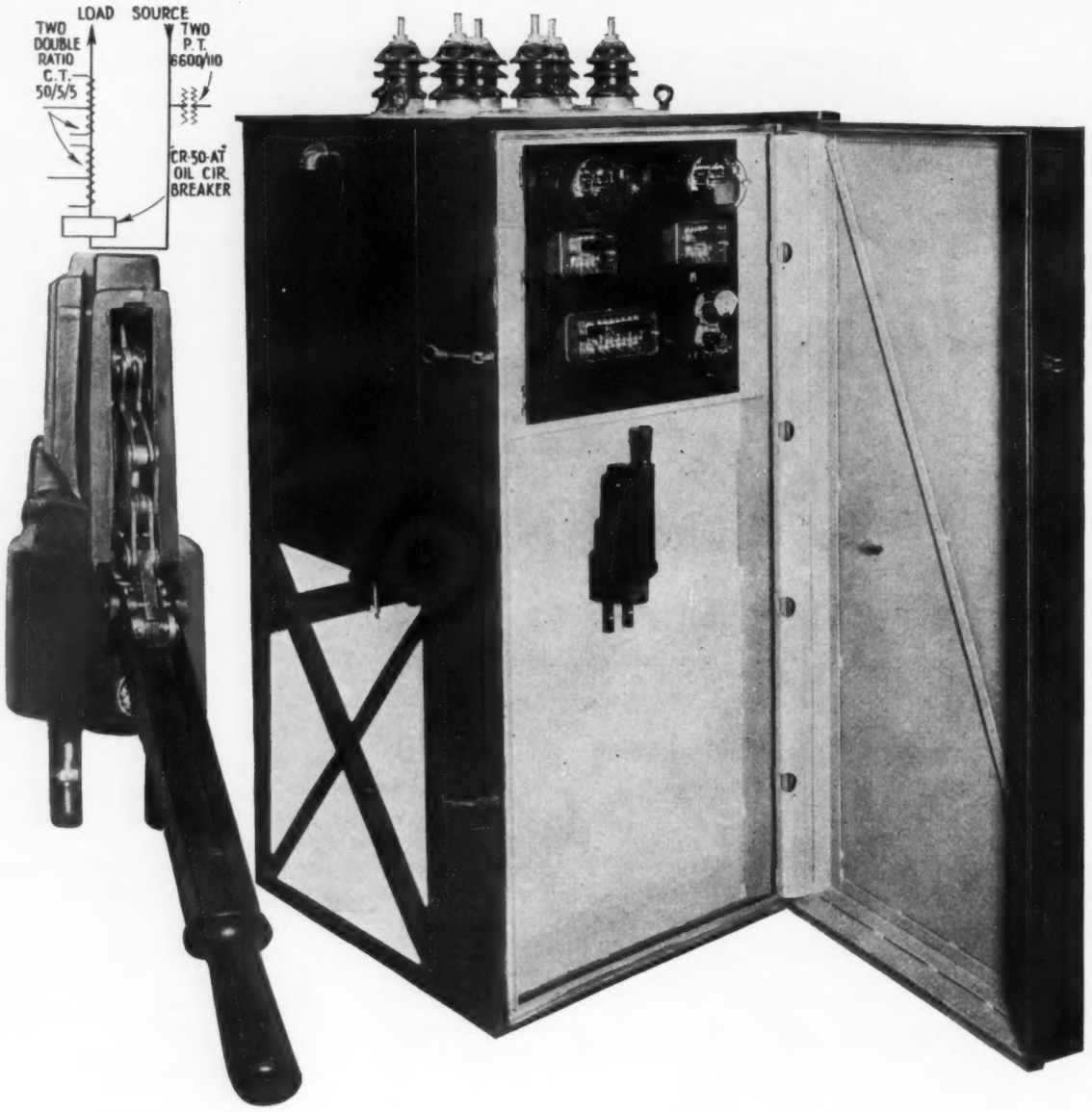

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ELECTRICAL WORLD

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for the Week Ending

January 23, 1932

Acme

Dr. H. C. Rentschler, research director Westinghouse Lamp Company, demonstrates the new positive-column sodium-vapor lamp perfected by Dr. Pirani of Berlin. (See "Electrical World," January 16, page 119.)

Holding company inquiry now sought

—**The House of Representatives** will tackle the problem of the holding company if the plans and hopes of Representative Rayburn of Texas are brought to fruition. Splawn may head—*p. 163.*

—**Another recovery plan offered.** This one seeks increased business activity through accelerated electric utility industry earnings and spending. Lawyer would have power men lead—*p. 189.*

A.E.C. indorses public works plan

—**Engineering Council members** at their Washington meeting voice approval of plan to create an Administration of Public Works for consolidation of government construction work. W. S. Lee elected president—*p. 162.*

—**The frequency-changer motor** is the latest idea for the production of higher-frequency energy. A modified squirrel-cage induction motor in which brushes and driving motor are eliminated is basis—*p. 192.*

—**Pennsylvania pot boils again** as Pinchot presents an eleven-point program for utility treatment and finds delegates to state conference not wholly with him. Commission against state-wide uniformity for rates—*p. 166.*

—**Rift in the financial clouds** appears as several elements of an adverse nature are cleared up and possibilities of a restored market for new security issues grow brighter—*p. 167.*

A manufacturer views merchandising

—**Observe the rights of all** is the injunction of Vice-President Quinn of General Electric, who has some positive ideas as to how merchandising should be carried on—*p. 178.*

—**Unit equipment idea spreads.** Latest adherent to the "factory-assembled-ready-to-install" concept is the switch-gear maker who has done his bit for greater standardization of equipment—*p. 196.*

Washington (D. C.) hearing resumed

p. 163.

A. E. C. Hears Comprehensive Report on Achieving Economic Balance

CONSOLIDATION of government construction work in an Administration of Public Works, as proposed in the Cochran bill, was indorsed by the assembly of the American Engineering Council on January 15 after discussion resulted in withdrawal of an amendment that would have disqualified any officer of the army or navy on the active or retired list from serving as administrator, director or as the head of any bureau in the new organization. A proposal that river and harbor work should be reserved to the Army Corps of Engineers also was withdrawn on a showing that the President's recommendation to Congress embraced the transfer of this function of the Engineer Corps.

In adopting the public works program the council acted upon the recommendations of its public affairs committee, headed by R. F. Schuchardt of Chicago.

Suggested lines of action for achieving economic balance were presented for discussion in a tentative report by R. E. Flanders, chairman of a special committee that has been studying the relation of production, distribution and consumption. Subject to review, the committee's conclusions are that maintaining and increasing the consumption of goods and services may be accomplished by the following means:

1. Increasing and stabilizing purchasing power through long-time governmental budgeting, long-time planning of public works, governmental reorganization and shorter working hours with cumulative overtime.
2. Balancing plant, machinery and processes against production demands.
3. Balancing distribution agencies against consumer requirements.
4. Balancing man power against production and distribution demands.
5. Controlling of money and credit to satisfy the needs of government, business and individuals through creative taxation and borrowing and long-time budgeting on the part of all governmental agencies, stabilization of money and purposeful search for profitable investment, in which the expert knowledge of the engineer is recognized by financial authorities.
6. Encouragement of research activity, particularly engineering research.
7. Balancing public works against public need by creative taxation and borrowing, long-time budgeting by government agencies and centralized public works control.
8. Balancing agricultural supply with an effective demand is sought in reconsideration of the government's reclamation policy, decentralization of industry and stabilization of money.

The committee's report embraced various recommendations designed to further the objects just enumerated. It concluded with the injunction that, in general, foreign credit and tariff policies must be based upon world economic conditions as revealed in the balance of international payments and should not be considered as independent and unrelated factors. The committee indorsed continuous studies of the economic situation by a permanent advisory council. With reference to industrial policies, the committee stated that the suggestions made in the proposals of Gerard Swope and the committee of the United States Chamber of Commerce for life and disability insurance, pensions and unemployment insurance are wholly desirable.

William S. Lee, president of the W. S. Lee Construction Company and former president of the A.I.E.E., was elected president of the council. The roster of other officers includes as vice-presidents L. B. Stillwell and General R. C. Marshall, Jr., both of New York, and as treasurer Farley Osgood.

▼

Pennsylvania Railroad Slows up Electrification

Unable to finance its electrification work on satisfactory terms, the Pennsylvania Railroad has been forced to slow down on its plans to run through electric trains from New York to Philadelphia this year and through trains to Washington next year. Work is also to be suspended on the Hoffman Street tunnel in Baltimore and slackened on the new Philadelphia terminal, railroad officials are quoted as saying.

The 1932 budget of the company

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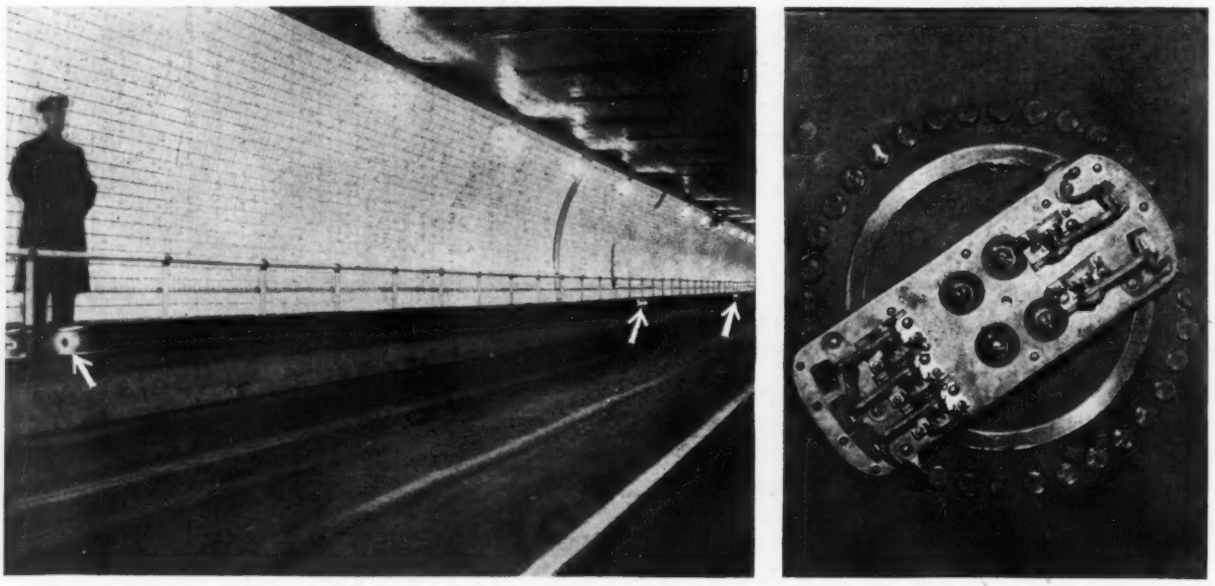
RUNNING LIGHTS SPEED HOLLAND TUNNEL TRAFFIC



Motorists hitting the upgrade in the Holland vehicular tunnel on their way from New Jersey to New York are guided for 1,000 ft. as to speed and spacing by the glow of 15-watt lamps along the wall. At intervals of 75 ft. appear the successively lighted lamps. Timing, accomplished by the motor-driven device here illustrated, may be varied, but is normally 35 miles an hour.

called for an expenditure of $124,000,000, to meet which only $30,000,000 is in sight, and bankers are said to have declined to finance the railroad's operations except on terms which Pennsylvania Railroad officials deem prohibitive. None of the projected work, however, is to be abandoned.

▼

Fitkin Gets Control of American Gas & Power

With the acquisition of control of the American Gas & Power Company, important unit of the American Commonwealths Power Corporation, now in receivership, A. E. Fitkin returns to the utility stage. The transaction brings Mr. Fitkin prominently into the American Commonwealths Power picture and suggests a way out of the receivership. It also eliminates further obligation of American Commonwealths Power to the United States & International Securities Corporation.

The securities acquired by Mr. Fitken are part of the collateral held by the said United States and International Securities Corporation, an investment company sponsored by Dillon, Read & Company, against a $3,000,000 loan to the American Commonwealths Power Corporation. The loan was payable January 4, but could not be met, and attempts were made to sell the collateral. Mr. Fitkin, it is understood, advanced sufficient cash to enable the company to pay its obligation.

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Still Another Inquiry Looms in Utility Field

A special rule was voted by the House of Representatives' rules committee a week ago under which authority for the comprehensive investigation urged by the House committee on interstate and foreign commerce into ownership of public utilities by holding companies will be granted promptly. The investigation will, it is predicted, be under the direction of Dr. Walter M. W. Splawn of the American University at Washington, who conducted the investigation of railroad holding companies for the same committee last year and who has been in charge of the Federal Power Commission's investigation in the same field. Including the long-drawn-out investigation of this and cognate matters by the Federal Trade Commission, the new inquiry will make three simultaneous federal inquisitions affecting light and power companies.

Representative Rayburn, chairman of the interstate commerce committee, told the rules committee that he would amend the resolution to except railroads from this year's investigation. He said that a later resolution would be offered to authorize expenditures of not exceeding $100,000. Pressed to explain just what his committee aimed to do, he said:

"We are aiming to develop the facts as to who owns and controls the public utilities of this country, just as we developed the facts in the last Congress so completely regarding the ownership and control of the railroads. We are not aiming at punishing anyone. We are not proposing to hold anyone up to scorn. We are not proposing to try a case in the newspapers to produce headlines. We want simply and solely to find out who owns and controls these public utilities, other than railroads, which are already established; we want to ascertain the ownership, control and interrelationship of stock holdings."

Fairness of rates would not be gone into, Mr. Rayburn said.

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Potomac Electric Power Case Is Before Court

Are the regulatory commissions concerned with utility profits or only with reasonable rates?

Appealing from an order of the Public Utilities Commission of the District of Columbia, the Potomac Electric Power Company charged in the Supreme Court of the District on January 18 that the commission had violated the consent decree entered by the court in 1924 establishing a sliding scale of rates based on a primary rate of return of 7½ per cent. In its order of June 8, 1931, the commission set up 7 per cent as the rate of return on the compromise 1925 valuation of $32,500,000 on the power company's property, undepreciated, plus additions and betterments, less retirements.

The commission's order was based on the allegation that the average net return of 10 per cent to the company in every year from 1925 to 1930 inclusive is excessive, although it did not attack the reasonableness of the rates charged by the company, which during this period have been reduced from 7.5 cents to 4.2 cents per kilowatt-hour to the household consumer. The immediate effect of the commission's order would be to reduce the household rate to about 3.6 cents. Under this order one-half of any excess return would be applied to rate reduction if the excess were 1 per cent or less, but the proportion would mount to three-quarters if the excess were over 1 per cent and to five-sixths if over 2 per cent.

Contending that the court and the court only can modify the decree entered into in 1924, S. R. Bowen, general counsel for the power company, declared that by its "back-door method" the commission not only would require the company to change its rates but to take less than a constitutional rate of return. Mr. Bowen cited numerous precedents for his assertion that the commission's sole duty is to fix reasonable rates to the public and that the profit to the company is not its concern.

W. A. Roberts, special assistant corporation counsel, and Richmond B. Keech, people's counsel, defended the validity of the commission's order, arguing that in signing the consent decree the commission did not surrender its right to supervise and regulate the sliding-scale arrangement nor its "power to make such other and further changes in rates, charges and regulations as the commission may ascertain and determine to be necessary and reasonable, and the right to alter or amend all orders relative thereto."

More Signs of Inflation in Business Outlook

RAPID progress toward completion of the Reconstruction Finance Corporation and other governmental and banking action to arrest deflation led the week's developments in the business situation. The inauguration of a period of inflation now seems certain.

Settlement of the railway wage tangle appears to be in sight, although the unions are holding out for certain concessions.

Any radical change in the basic materials industries seems further postponed. The rise in steel production to about 25 per cent of capacity is regarded as too small a change to be significant. Copper turned firmer on lower offerings, export plans and better developments abroad.

Exports in general continue to show at an accelerating rate the adverse effects of foreign currency depreciation, reduced buying power and increased tariffs.

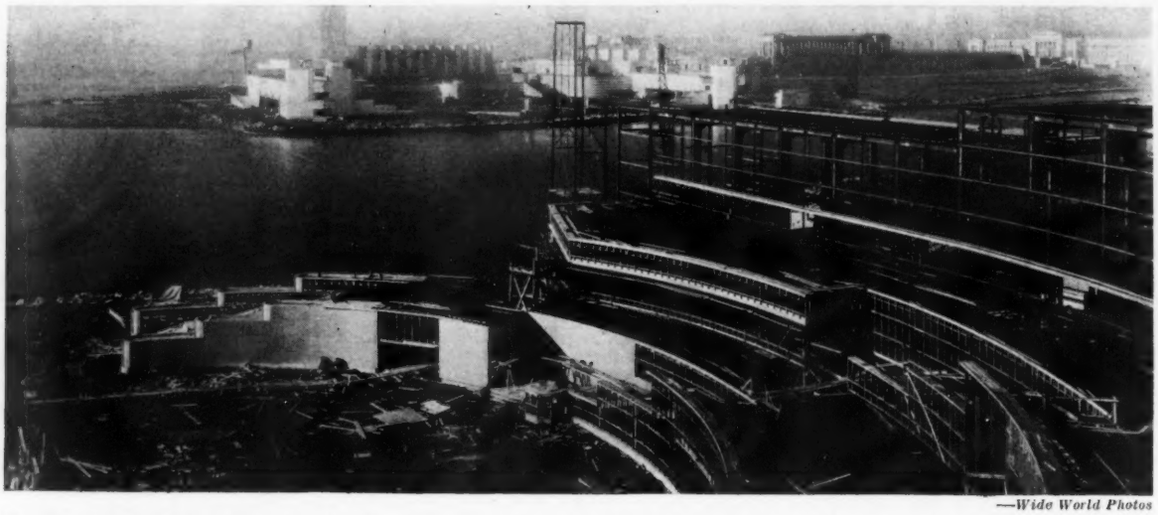
▼

Roosevelt Opposes Move of Niagara Falls Utility

A letter from Governor Roosevelt of New York to the Federal Power Commission opposing the effort of the Niagara Falls Power Company to make permanent the temporary permit it now enjoys to withdraw from the Niagara River 275 sec.-ft. originally allotted to the Hydraulic Race Company and certain mill owners in Lockport, N. Y., was read at an open hearing of the commission on January 18. Vesting this right in the Niagara Falls Power Company would give it a monopoly of the 20,000 sec.-ft. which the treaty with Canada permits to be withdrawn in the United States from the Niagara River. The city of Lockport was another applicant for the right to divert the 275 sec.-ft.

The power company paid the pre-

ELECTRICAL BUILDINGS UNDER WAY FOR CHICAGO FAIR NEXT YEAR



—*Wide World Photos*

Forty years after the remarkable demonstration of the infant electrical art at the Chicago World's Fair in 1893 its more mature but far from definitive stage will find a fitting theater at the Chicago World's Fair of 1933. The skeleton buildings shown are on Northerly Island. Across the lagoon, in the middle background, is the Hall of Science—"heart of the exposition."

▼

vious owners of the rights which it desires $1,500,000, and the Governor urged that, even should a permanent diversion of the extra water by the Niagara Falls company be permitted, consent to add this sum to the utility's capitalization be refused. He based his argument on the statement that the license surrendered by the Hydraulic Race Company and others was a minor-part one and could not become a major-part license merely by transfer, and that minor-part licenses do not carry with them the capitalization rights of major licenses.

The commission denied the Lockport application and continued hearings on the power company's. It admitted over protest testimony on oral agreements between company officials and O. C. Merrill, former executive secretary of the federal body, and exhibits of a documentary nature from its own and the company's files. R. J. Le Boeuf, Jr., and Vice-President William Kelly of the Buffalo, Niagara & Eastern Power Corporation represented the Niagara Falls Power Company, and Charles G. Blakeslee, counsel of the New York Public Service Commission, supported Governor Roosevelt's contentions.

▼

General Electric Orders Drop 26 per Cent

Orders received by the General Electric Company during the year 1931 amounted to $252,021,496, compared with $341,820,312 for 1930, a decrease of 26 per cent, President Gerard Swope has announced. Orders for the quarter ended December 31 amounted to $49,321,480, compared with $74,168,480 for the last quarter of 1930, a decrease of 34 per cent. Sales billed and earnings for the year 1931 are not yet available, but the complete annual report will be forthcoming in March.

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South Carolina Committee Asks Utility Regulation

Calling for reduced rates on electricity and advising a new and comprehensive regulatory act, to be administered by the State Railroad Commission, the South Carolina legislative committee appointed last year to investigate power rates has submitted its report to the General Assembly. The following proposals are made:

1. That 8 per cent per annum be allowed as a net annual return on the fair values of the properties of the electric companies.
2. That there should be a complete revision of rates and rate schedules by the companies to eliminate inequalities and discriminations and to bring about uniformity in rates as between the same classes of consumers, the same localities and the same companies.
3. That the income tax law be amended by allowing interest paid by the companies as a deductible item, provided that should revenues vital to the state be lost, then the rate of license tax on the gross revenues of the companies be increased to such a fraction of a mill as will overcome this loss.
4. That the one-half-mill kilowatt-hour tax be amended so as to tax electrical energy only at points of sale.
5. That a limit be placed on the taxing powers of communities.
6. That no additional special taxes be placed on utilities, but that as other sources of revenue are found the present taxes be reduced to not exceed 10 per cent of their gross revenue, and that as taxes are reduced rates should be lowered.
7. That the Railroad Commission require companies doing an interstate business to install meters on all transmission lines crossing the borders of the state.
8. That the powers of the Railroad Commission be extended to regulate utilities, the companies to finance this regulation through assessment.
9. That a bureau of rural electrification, properly financed and manned, be set up under the commission.
10. That the electric utility companies be required to keep separate operating ledger accounts of their merchandising of appliances and devices and that the expense of this merchandising be not charged to electric operation.

Saying that in no instance had there been "any slavish adherence to the present low level of prices, which is believed by the committee not to be fairly normal and reasonably indicative of the future," the committee fixed the value of the Broad River Power Company at $12,847,671, compared with $26,779,214 claimed by the company; of the Carolina Power & Light at $5,280,800, compared with $15,469,534; Duke Power, $31,500,604, compared with $75,461,221; South Carolina Power, $9,556,669, compared with $14,754,943, and Southern Public Utilities, $7,702,353, compared with $12,197,028.

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Rural Progress in Indiana Gains Momentum Fast

Indiana farms at the rate of 2,101 annually are modernizing their power equipment by the use of electricity, according to statistics compiled at Purdue University. One out of every six farms in Indiana is now thus equipped either from utility lines or by an individual plant.

Alabama Citizens Back Muscle Shoals Report

A delegation of fourteen Alabama citizens journeyed to Washington recently to present a memorial in support of the report of the Tennessee-Alabama Muscle Shoals Commission to the members of the Alabama and Tennessee congressional delegations, the Speaker of the House and other congressional leaders. They also called on President Hoover and on Secretary of War Hurley. The delegation included Lieutenant-Governor Hugh D. Merrill, representing Governor Miller; former Governor W. W. Brandon, A. M. Tunstall, Speaker of the Alabama House of Representatives, and leading agricultural, industrial and financial representatives from various sections.

The memorial contends that the iron and steel industry in Alabama is provided with capacity for any possible demands "for several years at least," that the same is true of the electrical industry, and that the establishment of a fertilizer and chemical industry will be of great industrial benefit.

The House committee on military affairs has the bill of Representative Almon, Alabama, which incorporates the recommendations of the Hoover commission for leasing the project to a private corporation, preferably farmer-owned and controlled, but in placing the emphasis upon the manufacture of "other chemicals" rather than fertilizer or power production the proponents of the development of Muscle Shoals seem to have retreated to the last ditch. The delegates from Alabama made an impression by the assertion that they do not want either power or fertilizer per se but desire development of a great electrochemical industry of which Muscle Shoals would be the hub.

Nothing is likely to happen yet awhile that will take Muscle Shoals off the hands of Congress. Edsel Ford has again testified to entire loss of interest in the project by the Ford industries.

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Public Ownership Action in California Cities

By a vote of three to two the City Council of Brawley, Calif., now served by the Southern Sierras Power Company, has determined to advertise for bids for a power plant and distribution system. A referendum may follow, although on May 21 last a proposed bond issue for such a purpose was decisively defeated.

Agitation in Tulare, Calif., for the acquisition of the Southern California Edison Company's distribution system and the subsequent distribution of energy by the municipality has resulted in an application to the California Railroad Commission to appraise the company's system within the city limits as a preliminary step to the submission of the question to the voters.

Pasadena, Calif., by its city board of directors, has voted to extend to 1933 the city's contract for the purchase of land and the Azusa hydro-electric plant of the Southern California Edison Company in San Gabriel Canyon for $783,949.

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Tennessee Power Dams of No Immediate Concern

Because of a lag in the demand for power, the army engineers do not believe that definite promises of co-operation for the construction of dams in the Tennessee River can be expected at this time. A report to this effect has been transmitted to Congress in compliance with a congressional resolution which called for a survey to determine the extent to which those interested in power development can be expected to co-operate in the improvement of the Tennessee.

In discussing the report before a meeting of the rivers and harbors committee, representatives of the War Department recommended that an appropriation of $17,000,000 be authorized for the improvement of the river between Riverton and Chattanooga. This improvement would be accomplished by constructing low dams and locks so as to insure a navigable depth of 9 ft. The special report was made to inform the committee as to the likelihood of co-operation by the power companies in constructing the dams. When the Tennessee River project was adopted provision was made so that any two of the low dams could be combined into a high dam for power purposes if those interested in power development would furnish the additional funds necessary.

Seventy-two communications from corporations and individuals concerned in power development—including the Alabama Power Company and the Tennessee Electric Power Company—indicated interest, but none of them contained a definite offer of co-operation. Since the army engineers believe that the chances of such participation are remote, they recommend that the construction of low dams be undertaken without further delay.

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Connecticut Tie Lines Are Planned for 1932

To strengthen the transmission network in the northern and eastern sections of its territory, the Connecticut Electric Service Company plans this year to expend about $410,000. A tie will be built to connect the Northern Connecticut Power Company system, which in general serves the region north of Hartford centering around Thompsonville, with the affiliated Rockville-Willimantic Lighting Company's lines east of the state capital. A second 66-kv. trunk line will also be completed from the Montville steam plant above New London to Mechanicsville. I. W. Day, vice-president Connecticut Light & Power Company, informs the ELECTRICAL WORLD that of the $3,400,000 construction budget approved for 1932 for the Service company's group of properties, about $1,772,000 will be expended for substation and distribution system improvements, including increases in the capacity of various supply lines and lower-voltage lines, substation enlargements and betterments, changes in distribution voltages and methods of supply, and new urban and rural lines.

Coming Meetings

American Institute of Electrical Engineers—Winter convention, New York, Jan. 25-29; district meeting, Milwaukee, March 14-16. F. R. Hutchinson, 33 West 39th St., New York.

Conference of Electrical Leagues — Philadelphia, Jan. 25-27. Society for Electrical Development, 420 Lexington Ave., New York.

North Central Electric Association — Commercial Section, Lowry Hotel, St. Paul, Jan. 29 and 30; Engineering Section, St. Paul Hotel, St. Paul, Feb. 22 and 23. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electric Light Association—Group committee meetings: Engineering National Section, New York, Feb. 1-5; Accounting National Section, Statler Hotel, St. Louis, Feb. 15-17; Commercial National Section, Edgewater Beach Hotel, Chicago, March 22-24. A. J. Marshall, 420 Lexington Ave., New York.

Process Heating Conference — Case School of Applied Science, Cleveland Feb. 10-12. W. R. Veazey, Case School, Cleveland.

Great Lakes Division N.E.L.A.—Sales conference and Commercial Section, Edgewater Beach Hotel, Chicago, Feb. 18-19; Engineering Section, Sherman Hotel, Chicago, April 13 and 14. R. J. Malcomson, 72 W. Adams St., Chicago.

National Association of Purchasing Agents—Public Utility Group, Birmingham, Ala., Feb. 18-20. G. A. Renard, 11 Park Place, New York.

Oklahoma Utilities Association—Tulsa, Okla., March 8 and 9. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

Maryland Utilities Association — Lord Baltimore Hotel, Baltimore, April 8. D. E. Kinnear, 803 Court Square Bldg., Baltimore.

New England Division, N.E.L.A.—Safety conference, Boston, April 8. Miss O. A. Bursiel, 20 Providence St., Boston.

Arizona Utilities Asosciation—Tucson, Ariz., April 13-15. J. S. Arnold, Central Arizona Light & Power Co., Phoenix, Ariz.

Southeastern Division, N.E.L.A.—Old Point Comfort, Va., April 20-22. C. M. Kilian, 508 Haas-Howell Bldg., Atlanta.

Southwestern Divison, N.E.L.A. — Arlington Hotel, Hot Springs, Ark., April 25-28. S. J. Ballinger, San Antonio Public Service Co., San Antonio.

Missouri Association of Public Utilities —Excelsior Springs, Mo., April 28-30. F. D. Beardslee, 315 N. 12th St., St. Louis.

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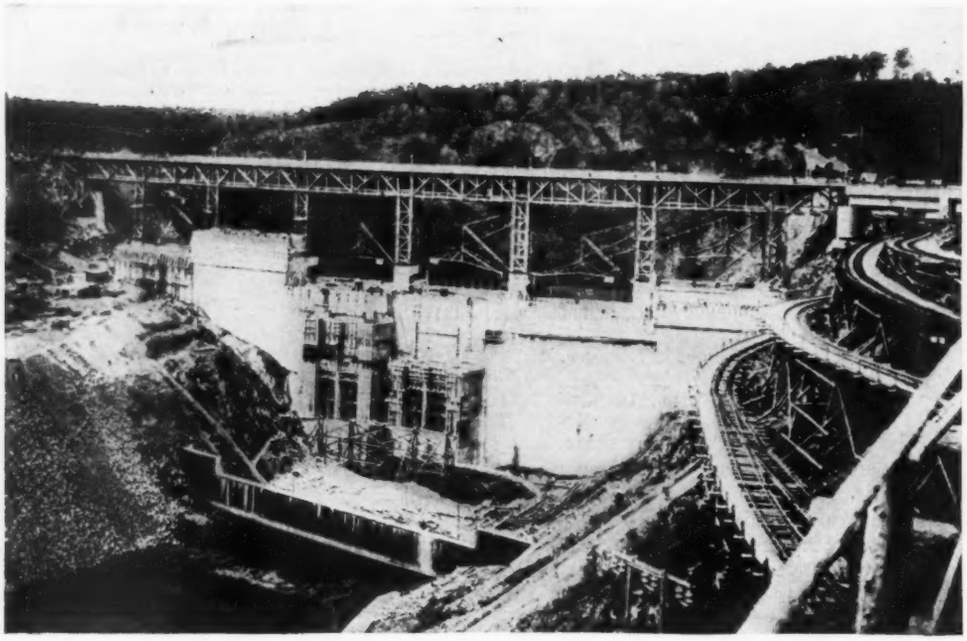

GERMANY'S LARGEST DAM APPROACHES COMPLETION

Bleiloch Dam near Saalburg in Thuringia is one of the largest in Europe. About 700 ft. long and 200 ft. high, it impounds the waters of the Saale River for power generation and flood control

▼

New Jersey Executive Seeks New Utility Tax

Because nearly all of the public utilities in New Jersey "are now engaged in interstate business of some kind or another," the retiring Governor, Morgan F. Larson, in his message to the Legislature last week, declared that it may be necessary to abandon the gross receipts tax which has been in effect since 1900 and to adopt another method of taxing the utilities. "No more important problem confronts you at this session of the Legislature," he said.

The Governor referred to the decision of the Supreme Court of the United States in 1930 holding that the tax cannot be applied to receipts from interstate telephone business. He declared that if this principle is applied to all other utilities, the municipalities will be deprived of a large amount of revenue and that some means of replacing it must be found.

▼

Pennsylvania Commission Against State-Wide Rates

Three members of the Public Service Commission of Pennsylvania voted last week for a resolution to adopt a uniform schedule of reduced rates by all light and power companies in the state. Commissioner George W. Woodruff presented the resolution and voted for it, together with Commissioner Frederick P. Gruenberg and J. W. Brown. Chairman W. D. B. Ainey and Commissioners S. Ray Shelby and Samuel Walker did not vote. Commissioner Emerson L. Collins was absent. The resolution was declared lost, since a majority of the commission did not vote for it.

The maximum monthly rates for domestic service proposed by the resolution were: Seventy-five cents as a minimum charge for the first 15 kw.-hr., 5 cents per kilowatt-hour for the next 25 kw.-hr., 3½ cents for the next 60 kw.-hr. and 2½ cents for all additional. It was proposed also to restrict penalties for delay in payment to 2½ per cent for the first 30 days after mailing of the bill and 5 per cent for a delay of more than 30 days.

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Pinchot Has Eleven Rules for Control of Utilities

To a meeting of representatives of cities, boroughs and townships called at Harrisburg, Pa., on January 14, to discuss utility rates and regulations Governor Pinchot of that state presented a program of eleven points. These are as follows:

1. Prohibit the issuance of utility stocks until the commission has approved them.
2. Require the establishment of an excess earnings reserve of utilities.
3. Permit districts to condemn and operate public utilities.
4. Limit the life of utility charters to 50 years.
5. Give the Public Service Commission jurisdiction over holding companies and affiliated subsidiaries.
6. Prohibit new schedules of rates from becoming effective until after the commission has given its approval.
7. Permit the payment of reparations by classes instead of individual cases.
8. Eliminate the "ready-to-serve" charge.
9. Make utilities pay for replacements out of reserves.
10. Extend rural electric lines at cheap rates.
11. Eliminate the requirement that the Public Service Commission pass on contracts entered into between utilities and municipalities.

Mr. Pinchot did not include the recommendations he made to the 1931 Legislature that the law be revised to permit the Governor to remove members of the Public Service Commission, to create a Fair Rate Board in place of the present commission, and to adopt the prudent-investment method of valuation.

The Harrisburg gathering was a tumultuous one. Speakers defending utility companies were shouted down, and even the Governor came in for criticism. Permanent organization to work for reduction of rates was not effected in the manner hoped.

▼

San Francisco Now Has Public Utilities Body

Under the charter which went into effect in the city and county of San Francisco on January 8 new major appointments of engineering interest by the Mayor are the chief administrative officer and the Public Utilities Commission. Alfred J. Cleary, appointed chief administrative officer, will be in charge of eleven municipal departments, including electricity and public works. Lewis F. Byington, San Francisco attorney and former member of the Board of Supervisors, has been appointed by Mayor Rossi as chairman of the city's Public Utilities Commission. The four other members of the commission appointed by the Mayor are representative business men. This commission of five is responsible for the management, control and operation of Hetch Hetchy construction, the municipal railway system, the San Francisco water depart-

ment, the airport and any other utilities that may be acquired and operated by the city and county. Reorganization of the engineering department is awaiting action of the utilities commission and the director of public works. It is predicted that M. M. O'Shaughnessy, city engineer, many of whose former responsibilities have been done away with, will be transferred to a place under the Public Utilities Commission where he will complete Hetch Hetchy.

▼

Massachusetts Has Two Anti-Merchandising Bills

A bill to prohibit public utilities from selling at retail appliances, equipment or any products of their own manufacture or made by a subsidiary has been filed in the Massachusetts Legislature by Representative L. B. Libbey. Violations of this proposed law would be punishable by fines of not less than $100 nor more than $1,000, with each day of violation constituting a separate offense. This is the second bill introduced to prevent appliance sales by public utilities.

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Mississippi Also Has Anti-Merchandising Bill

Political desire to prohibit utility companies from selling appliances has spread to Mississippi, Senator J. F. Waddell of Meridian having introduced a bill in the Legislature last week to that end. It is aimed at electric light and power and gas companies and would prohibit them from selling ranges, washing machines, flatirons and other appliances. The bill, if it becomes a law, is to take effect on June 1. It has been referred to the committee on agriculture, commerce and manufacturing, which will hold a hearing on it next week.

▼

Commission Asks Court to State Elements of Value

Confessing itself "in doubt as to the elements of value to be considered in determining the valuation of the property of public utilities for the purpose of fixing rates," the Public Utilities Commission of the District of Columbia has filed in the Supreme Court of the District a petition asking the court to instruct the commission as to these elements of value. This procedure is authorized by the public utilities act, but never before in the nineteen years of the commission's existence has it been invoked, according to an oral statement made at the office of the commission.

Major Factors Are Operating to Facilitate Financing

FUNDAMENTAL, if not particularly spectacular, developments are taking shape in the financing markets. Their continuance would very greatly improve the outlook for major financing.

Much has been made of the large capital-raising program facing the utilities this year. More than $500,000,000 is needed to take care of maturities alone. Many companies have bank loans arising out of construction costs, which must shortly be converted into funded debt. The bond market has not been in a condition to perform this conversion operation.

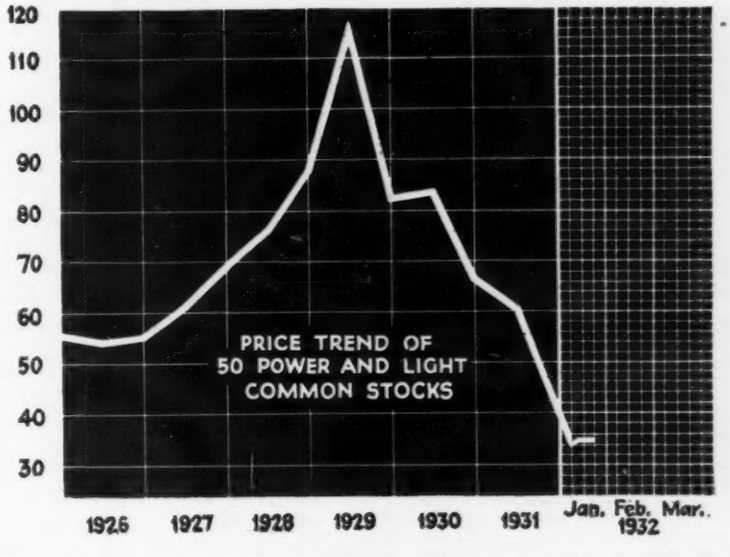
What are the indications that this financing program will be less formidable than it looked a few weeks ago? It might be said that these bank loans which utilities have incurred are relatively more attractive to bankers than much other available business. In many cases renewals would not seem to be difficult to obtain. Then, net earnings of those companies reporting to date make a rather better showing than was anticipated in many cases, so that the necessity of converting floating to funded debt is less of an emergency than might have been expected.

Turning to the market itself, bond prices have shown much greater resistance recently and the whole market for senior securities seems to be taking on a better complexion. There is a growing conviction that it is reaching the point where substantial issues would be readily absorbed. The high yield obtainable on certain high-grade preferred issues seems to suggest the belief that high-priced debt may be placed ahead of them. Yields of well over 6½ per cent are obtainable on many highly regarded preferred issues.

Further Federal Reserve action

In addition to a possible further reduction by the Federal Reserve Bank of New York in its bill-buying rate, which was lowered one-quarter of 1 per cent last week, reducing open market rates, there is expectation in certain quarters of a downward revision in the rediscount rate. This latter action in the past has usually been preceded by such adjustments in the acceptance rate. If this is the correct guess with regard to possible Federal Reserve action, the market as a whole should shortly feel the effect.

Then, again, there is a growing impression that the long-predicted inflation is likely to become a certainty. The prompt completion and operation of the Reconstruction Finance Corporation is indicated. Whether or not most of the effort, initially at least, will be in the direction of assistance to the railroads, the securities markets as a whole will feel the effect. The net result should be in the direction of making the market for senior financing more receptive.



Utility stocks, along with the rest, settled down this week to a narrow trading range as if to await more tangible results from the several potential stimulants still in the formative stage. The public continues to remain virtually out of the market. This is regarded as largely psychological, although the banking situation has certainly reduced buying power sharply in many parts of the country.

United Corporation Group Just Earned Its Dividend

United Corporation, first of the big utility systems to give an account of its 1931 business, just earned its 75 cent dividend flat. Net profits increased almost 15 per cent over 1930. In that year it earned 78 cents a share on common stock, but the number of shares increased from 12,360,531 to 14,531,197 in the meantime.

Naturally the portfolio of this superholding company shows a drastic shrinkage in values. Total cost or declared value of securities held at the end of 1931 was $592,821,748, while estimated market value at that date was $269,405,996, a depreciation of 54 per cent. Shrinkage at the end of the previous year amounted to but 27 per cent. Surplus was sharply reduced.

	1931	1930
Dividends and interest	$19,392,789	$15,731,329
Profits on sales of securities, etc.	.....	1,039,380
Total income	$19,392,789	$16,769,709
Interest paid	477,321	162,644
Current expenses	470,141	467,538
Reserve for federal taxes	.....	60,000
Net profit	$18,445,327	$16,079,527
Preferred dividends	7,466,010	6,402,457
Common dividends	10,491,345	6,180,170
Surplus	$487,972	$3,496,900

This first 1931 report provides a rough gage of market values. At a current price of around $10, United Corporation common is selling at about thirteen times last year's earnings. Its range for 1931, omitting fractions, was 31-7; for 1930, 52-13, and for 1929, 75-19. The public in 1929 seemed to think the stock was worth 154 times earnings at the top price. Market valuations have been fairly well revised.

Assets of the United Corporation at the end of 1931 were $593,918,455, against $555,257,183 a year previous; that is, when security holdings are valued at what they cost the corporation.

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Investment Trust Set Up Which Holds Only Bonds

An investment trust whose portfolio includes only bonds is announced by G. L. Ohrstrom & Company under the name of first bond trust shares. There are 24 bonds on the list, and 15 of these are utility bonds. All are listed on either the New York Stock Exchange or the New York Curb market.

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Arizona Utility Defers Dividend

Directors of the Arizona Edison Company recently voted to defer the usual quarterly dividend of $1.62½ per share due January 1 on the $6.50 cumulative preferred stock, no par value. The last quarterly distribution on this issue was made October 1.

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A. T. & T.'s Earnings Will Assure Dividend

Preliminary studies indicate that the American Telephone & Telegraph Company earned its dividend with a small margin without taking into account its proportion of undistributed earnings of subsidiaries. Earnings of these companies, including Western Electric Company, Inc., taken as a group, also exceeded their dividend payments.

Detroit Edison Net Up Despite Drop in Gross

In the face of a drop of 8.3 per cent in gross earnings for 1931, the Detroit Edison Company has been able to show an actual gain of 1.4 per cent in net income. This is only the second time in Detroit Edison's history that gross earnings have shown a decline from the previous year. The rise in net income, despite a decline in gross, was made possible by a rigid scaling of operating costs. Retirement reserve provision is also lower than for 1930.

Lowered industrial activity in the Detroit area, particularly a drop in automobile sales and output, reduced the use of current used by the railways and bus competition showed an increase. Steam sales fell off badly. Domestic electric service was the only large class of service that did not decline.

Output of electricity generated by power plants and purchased from other companies last year was 2,170,253,600 kw.-hr., against 2,384,528,500 for 1930, a 9 per cent drop and an 18.3 per cent drop from the 1929 total.

Plant investment account increased only 2 per cent last year, the smallest yearly increase since 1918. Total assets rose 3.2 per cent, to $315,209,395.

An important piece of refinancing was carried out in the redemption of a long-term bond issue totaling $34,984,000. More than half of the issue bore interest at 6 per cent and the remainder at 5. Although not due until 1940, the issue was called for redemption March 1 at a premium of 5 per cent and an issue amounting to the same total, bearing 4½ per cent interest, was sold.

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Current Earnings Reports of Electric Light and Power Companies

Operating Companies

	1931	1930	Per Cent Increase	Operating Ratio 1931	Operating Ratio 1930
Birmingham Electric (Year ended November 30)					
Gross earnings	$7,427,206	$8,333,475	—11.0	69	70
Net earnings	2,311,418	2,574,688	—10.0	..	..
California Oregon Power (Year ended November 30)					
Gross earnings	3,872,338	3,887,415	—0.4	..	..
Net earnings	1,788,732	2,274,811	—21.4	..	..
Carolina Power & Light (Year ended November 30)					
Gross earnings	9,665,780	8,985,381	8.0	50	44
Net earnings	4,846,496	5,023,875	—4.0	..	..
Houston Lighting & Power (Year ended November 30)					
Gross earnings	8,538,541	8,811,174	—3.0	46	52
Net earnings	4,599,243	4,213,448	9.0	..	..
Louisville Gas & Electric (Year ended November 30)					
Gross earnings	10,803,331	10,571,658	2.2	..	..
Net earnings	5,984,341	5,381,279	11.2	..	..
Memphis Power & Light (Year ended November 30)					
Gross earnings	6,977,474	6,783,173	3.0	58	59
Net earnings	2,914,660	2,788,989	5.0	..	..
Mountain States Power (Year ended November 30)					
Gross earnings	3,399,327	3,468,480	—2.0	..	..
Net earnings	1,176,578	1,246,120	—5.6	..	..
Northern States Power (Year ended November 30)					
Gross earnings	33,997,112	33,146,773	2.5	..	..
Net earnings	17,552,420	16,634,647	5.5	..	..

Operating Companies

	1931	1930	Per Cent Increase	Operating Ratio 1931	Operating Ratio 1930
Oklahoma Gas & Electric (Year ended November 30)					
Gross earnings	$11,939,186	$14,444,888	—17.4	..	..
Net earnings	5,718,556	6,871,876	—16.7	..	..
Pennsylvania Power & Light (Year ended November 30)					
Gross earnings	34,727,902	30,935,577	12.0	48	49
Net earnings	17,853,052	15,736,984	13.0	..	..
San Diego Consolidated Gas & Electric (Year ended November 30)					
Gross earnings	7,430,578	7,380,797	0.7	..	..
Net earnings	3,795,277	3,695,808	3.7	..	..
Southern Colorado Power (Year ended November 30)					
Gross earnings	2,115,194	2,293,456	—7.8	..	..
Net earnings	1,000,707	1,077,054	—7.1	..	..
Wisconsin Public Service (Year ended November 30)					
Gross earnings	5,537,054	5,619,837	—1.5	..	..
Net earnings	2,392,294	2,342,549	2.1	..	..
Wisconsin Valley Electric (Year ended November 30)					
Gross earnings	2,361,954	2,253,770	4.8	..	..
Net earnings	988,090	945,691	4.5	..	..

Holding Companies

Philadelphia Company (Year ended November 30)					
Gross earnings	56,917,301	61,863,398	—8.0	..	..
Net earnings	28,798,211	30,168,007	—4.5	..	..
Standard Gas & Electric & subs. (Year ended November 30)					
(Gross earnings)	146,771,227	154,205,232	—4.8	51	52
Net earnings	72,431,754	73,896,500	—2.0	..	..

Another $80,000,000 Announced for New Construction

INTENTION to spend $80,000,000 on new construction in 1932 was announced this week by a number of utility systems in various parts of the country.

Expenditures in excess of $11,000,000 will make up the capital budget of the Southern California Edison Company, Ltd., for 1932, according to a statement made by R. H. Ballard, president, in announcing the company's general program for the year.

"Conforming to the program which we laid down for ourselves two years ago, better than 50 per cent of our capital expenditures for 1932 will be used for the building up of distribution lines and substations," Mr. Ballard said. "Our generating capacity of 1,258,000 hp. in water-power and steam generating plants and major transmission lines is adequate to take care of the needs of southern California at the present rate of growth for some years to come and it is therefore only necessary for us further to develop the network of service lines throughout our territory.

"The total sum to be spent for distribution lines and substations is $7,026,000, which makes up the largest single item of the $11,397,000 budget.

"A sum of $1,862,000 has been set aside for the construction of transmission lines, and an additional $283,000 will be used in construction and enlargement of transmission substations."

Nearly $4,000,000 will be expended by the Los Angeles Gas & Electric Corporation during 1932 for betterments and additions to its gas and electric systems, according to Addison B. Day, president and general manager.

"About one-half of this amount will be for this year's share of the construction work to be done on the addition to our Seal Beach electric generating station, which will result in a 50 per cent increase in the capacity of the plant," Mr. Day said. "This project will not be completed until 1933 and will entail a total cost of approximately $3,500,000."

Public Service Company of Colorado

A budget that calls for more than $1,500,000 on new construction, improvements and replacements in 1932 by the Public Service Company of Colorado has been announced by Clare N. Stannard, vice-president and general manager.

The 2,000-kw. Diesel engine recently completed at Sterling, Colo., is part of the 1932 program and is listed at $225,000. A half million dollars is allocated to underground and overhead electric line construction, an activity that will affect congested population centers as well as the more sparsely settled regions.

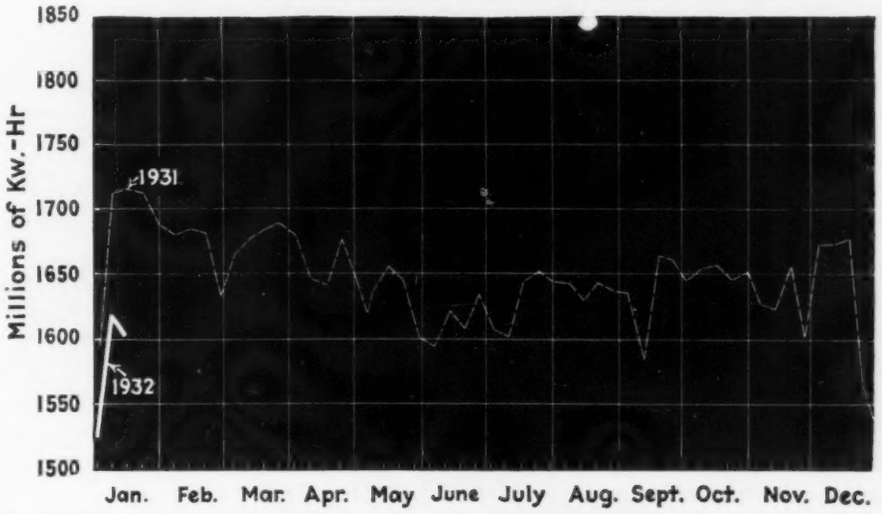
Utility subsidiaries of the United Gas Improvement Company will spend more than $28,000,000 in 1932 for additions and improvements to plant equipment, John E. Zimmermann, president of the company, has announced. This money, Mr. Zimmermann said, largely will be spent for the extension of gas and electric service in the territories supplied by the various companies.

The construction budget of the Pacific Gas & Electric Company for this year has been tentatively set at $31,000,000, including the cost of a 66,000-hp. steam generating plant in the southern end of the San Joaquin Valley, a second natural-gas pipe line from San Jose to San Francisco and a 66,000-hp. addition to the Mokelumne hydro-electric project.

More than $2,500,000 will be spent by subsidiaries of the Central & South West Utilities Company for new construction work in 1932. The work will include the completion of the Central Power & Light Company's 16,000-hp. hydro-electric generating station at Eagle Pass, Tex., as well as extensions to serve any increased business in the east Texas and west Texas oil fields. Interconnections and transmission lines to increase efficiency and economy of service throughout the properties are also planned.

The boards of directors of the Public Service Corporation of New Jersey and its operating companies have approved budgets for 1932 totaling upward of $12,250,000. Including amounts to be expended on projects initiated prior to January 1, 1932, total expenditures for construction by the Public Service Electric & Gas Company this year will amount to more than $17,500,000, of which approximately $15,000,000 will be spent by the electric department and $2,500,000 by the gas department. Expenditures by the electric department under the 1932 budget will be used largely for extending and improving distribution lines and equipment, new high-voltage lines and substation equipment. No major construction plans are included in the budget.

Output Down 6.7 per Cent



OUTPUT of electric light and power companies during the week ended January 16 was 6.7 per cent lower than in the corresponding week of the preceding year. The decrease is the largest thus far reported, though it has been closely approached several times. The central industrial area had the largest percentage decline; the Pacific Coast improved slightly from the week before.

The accompanying tables show comparable weekly output, as announced by the National Electric Light Association, and the changes in certain areas.

Weekly Output, Millions of Kw.-Hr.

	1931	1930	1929	1928
December 12....	1,672	1,748	1,841	1,716
December 19....	1,676	1,770	1,860	1,710
December 26....	1,565	1,617	1,638	1,527
	(1932)	*(1931)*	*(1930)*	*(1929)*
January 2.....	1,524	1,597	1,680	1,542
January 9.....	1,619	1,714	1,816	1,734
January 16.....	1,602	1,717	1,834	1,737

Per Cent Change from 1931

Region	Week Ended Jan. 2	Jan. 9	Jan. 16
Atlantic seaboard.....	—1.7	—1.6	—2.6
New England alone.....	—2.0	—2.6	—2.8
Central industrial.....	—7.0	—7.8	—9.4
Chicago district.....	—4.4	—4.1	—6.4
Pacific coast.....	—7.0	—8.8	—7.4

Light and Power November Gain Less than Seasonal

REVENUE for electric light and power in November as usual exceeded that of October, but by less than the customary amount, the increase being to $180,310,000 from $178,630,000 in the preceding month. This total falls short by 3.7 per cent of that for November, 1930. Meanwhile operating and maintenance expenses fell off 4.5 per cent from $78,840,000 a year ago to $75,270,000. These estimates for the industry as a whole are based on returns received by the ELECTRICAL WORLD from companies throughout the United States.

As it shown on the chart, when the revenue is expressed in terms of the daily average the seasonal climb from $5,750,000 in October to $6,010,000 in November was substantial. In many industries a 4.5 per cent increase from one month to the next would be a cause for satisfaction.

It is worth noting that the per cent changes in revenue and in energy output are much more nearly alike than they were a number of months ago. For example, in May, 1931, the revenue was down only 0.8 per cent compared with 1930, whereas the energy was down 4.7 per cent, after 4.5 per cent in April. The reason was that the decrease in industrial power sales was approximately balanced in revenue but not in kilowatt-hours by gains in domestic energy.

While this movement has by no means come to an end, it is apparently slackening. Power sales, wholesale and retail, continue to be lower than in 1930; domestic sales continue higher but by a smaller margin. Intercompany sales also have decreased.

That each separate geographical region should have a smaller revenue than in the year before is unusual; even New England, which in recent months generally reported a comfortable gain, fell behind. Details appear in Table II. Comparison with a similar table, published in the ELECTRICAL WORLD of January 2, will reveal a rise compared with October in most sections of the country.

Regional balance between hydro-electric and fuel-generated energy reflects various conditions of stream flow—conspicuous deficiency throughout the South and West, and an improvement over previous drought conditions elsewhere.

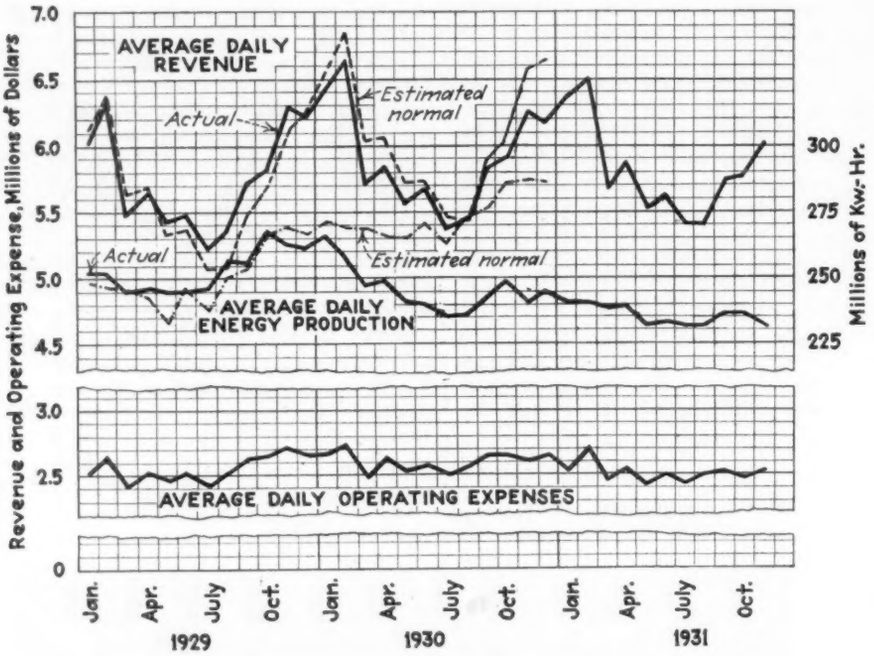


Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1931	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
August	7,158,675	—3.0	2,260,966	+0.2	4,897,709	—4.4	2,025,000	+1.5
September	7,087,057	—3.1	2,006,645	—2.5	5,080,412	—3.3	1,963,000	—0.2
October	7,323,562	—5.0	1,897,746	—9.1	5,425,816	—3.5	2,040,000	—3.5
November	6,972,325	—3.5	1,946,784	—3.2	5,025,541	—3.7	2,020,000	—1.0

Table II—Regional Operations, Revenue and Energy Output in November, 1931

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	180,610	—3.6	6,972,325	— 3.5	1,946,784	— 3.2	5,025,541	— 3.7
New England	18,840	—0.9	471,617	— 4.3	200,493	+24.0	271,124	—18.1
Middle Atlantic	47,450	—2.9	1,826,236	— 2.7	400,917	+25.3	1,425,319	— 8.5
East North Central	42,550	—4.2	1,630,033	— 5.9	205,850	+73.0	1,424,183	—11.8
West North Central	15,130	—3.7	467,493	+ 0.3	116,054	+29.7	351,439	— 6.7
South Atlantic	19,510	—1.5	797,133	+ 2.6	186,704	—19.8	610,429	+12.1
East South Central	6,160	—3.7	242,252	—17.8	134,531	—33.6	107,721	+16.9
West South Central	11,390	—2.7	388,118	— 1.3	3,617	—40.2	384,501	— 0.7
Mountain	4,350	—4.0	225,561	—13.3	160,881	—20.5	64,680	+12.5
Pacific	15,230	—1.6	923,882	— 8.5	537,737	—20.5	386,145	+51.4

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenance Expense†	
	1931 Thousands	Per Cent Inc.	1931 Thousands	Per Cent Inc.
Aug.	167,380	—0.4	75,590	—3.5
Sept.	171,930	—1.7	75,300	—4.4
Oct.	178,630	—2.4	77,050	—5.6
Nov.	180,610	—3.6	75,270	—4.5

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

New York Metal Prices

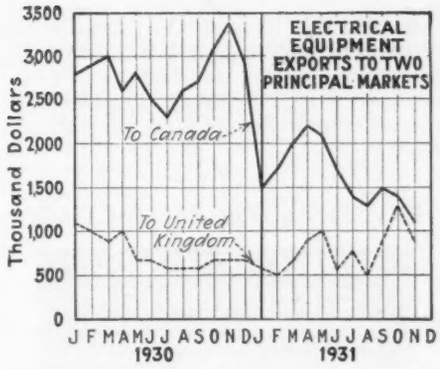
	Jan. 13, 1932 Cents Per Pound	Jan. 20, 1932 Cents Per Pound
Copper, electrolytic	7.50	7.25–7.50
Lead, Am. S. & R. price	3.75	3.75
Antimony	6	6
Nickel, ingot	35	35
Zinc, spots	3.40	3.35
Tin, Straits	21.70	22.25
Aluminum, 99 per cent.	23.30	23.30

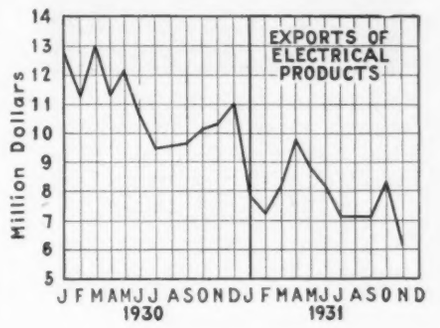
Exports React to Tariff and Money Depreciation

Adverse effects of currency depreciation and the rise of tariff walls abroad begin to be reflected in exports of electrical equipment from this country. For 1931 to the end of November totals showed a decline of 28.5 per cent from 1930.

Monthly exports to our two principal markets—Canada and the United Kingdom—show a sharp down-turn in November. In the case of exports to Canada this continues a trend which has been under way since the beginning of the business depression. This situation is somewhat complicated, however, by the fact that branch plants of United States manufacturers export a volume of electrical goods of American origin to other parts of the British Empire.

Shipments to the United Kingdom, the second most important market, have been maintained at about the same level over the past two years. These totals, in fact, rose sharply in September and October, in anticipation, presumably, of coming tariff and monetary difficulties. The maintenance of present high levels in exports to Britain is remarkable in view of the depreciation of sterling.





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County Surveys for Thirty-one States

Statistics on the number of homes receiving electric service, by counties and for places of 2,500 and over, are now available for 31 states, sheets for six states having recently been issued supplementing the 25 to which reference was made on page 1105 of the ELECTRICAL WORLD of December 19. The information is published by the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce. The count was made with the co-operation of the National Electric Light Association and its member companies.

Sheet 9 gives figures for Kansas, South Dakota, North Dakota and New Mexico; sheet 10 for Georgia and New Jersey.

Exports of Electrical Equipment (Preliminary)

Article	November 1930	November 1931
Generators:		
Direct current—		
Under 500 kw	$42,765	$7,294
500 kw. and over	14,900	.....
Alternating current—		
Under 2,000 kva.	21,888	4,660
2,000 kva. and over	4,500	9,139
Steam turbine generator sets	10,521	7,057
Accessories and parts for generators	53,282	74,924
Arc welding sets	45,697	87,993
Self-contained lighting outfits	47,893	8,935
Batteries:		
6-volt storage batteries	139,342	108,916
Other storage batteries	130,048	32,061
No. 6 dry cell batteries	40,268	24,956
Flashlight batteries	291,217	190,920
Radio B and C batteries (dry)	25,026	14,804
Other dry and wet cell primary batteries	12,073	4,113
Transforming or converting apparatus:		
Power transformers, 500 kva. and over	35,853	7,488
Distribution transformers, less than 500 kva.	64,847	19,977
Instrument transformers	12,271	12,400
Other transformers	43,773	36,923
Complete battery chargers under 15 amp.	7,799	4,184
Double-current motor generators, dynamotors, synchronous, and other converters	108,148	147,128
Transmission and distribution apparatus:		
Switchboard panels, except telephone	252,349	46,314
Power switches and circuit breakers over 10 amp.	119,568	45,257
Fuses	17,610	7,891
Watt-hour and other measuring meters	35,929	30,625
Electrical indicating instruments	42,388	26,297
Electrical recording instruments	20,540	31,684
Other electrical testing apparatus	69,635	50,210
Lightning arresters, choke coils, reactors, and parts	38,699	34,588
Motors, starters, and controllers:		
Motors, ¼ hp. and under	137,895	55,352
Motors, over ¼ and under 1 hp.	36,790	12,599
Stationary motors—		
1 to 200 hp	$182,309	$36,543
Over 200 hp.	51,499	3,330
Railway motors	18,520	34,804
Electric locomotives—		
Railway	98,644	.....
Mining and industrial	40,310	.....
Station and warehouse electric motor trucks	21,979	10,018
Starting and controlling equipment—		
For industrial motors	115,307	84,188
For electric railway and vehicle motors	6,008	4,485
Portable electric tools	85,434	60,131
Accessories and parts for motors	165,557	323,117
Electric refrigerators and parts:		
Household	315,952	290,966
Commercial up to 1 ton	125,422	57,811
Parts for electric refrigerators	.....	101,896
Electric appliances:		
Electric fans	52,663	29,547
Electromechanical health exercisers	7,026	506
Electric incandescent light bulbs—		
For automobiles, flashlights and Christmas trees	15,539	12,972
Other metal filament bulbs	63,139	37,595
Other electric lamp bulbs	8,685	6,154
Flashlight cases	77,913	22,777
Searchlights and floodlights	32,995	7,970
Electric household washing machines	88,838	46,552
Electric domestic vacuum cleaners	100,548	131,180
Other domestic motor-driven devices, except tools	47,965	44,916
Electric flatirons	11,053	14,606
Electric cooking ranges	59,285	39,967
Other domestic heating and cooking devices	104,799	49,432
Industrial electric furnaces, ovens, and other heating devices	23,673	25,284
Therapeutic and X-ray apparatus	120,605	86,263
Signal and communication devices:		
Radio apparatus—		
Transmitting sets, tubes, and parts	95,792	28,806
Receiving sets	2,178,496	1,454,850
Radio receiving tubes	201,929	185,285
Signal and communication devices (continued)		
Receiving-set components	$623,809	$387,871
Loudspeakers	146,565	66,306
Other receiving-set accessories	649,836	40,602
Telegraph apparatus	61,633	13,410
Telephone apparatus—		
Telephone instruments	39,419	13,286
Telephone switchboards	12,662	11,131
Other telephone equipment	183,102	44,927
Bells, buzzers annunciators and alarms	42,236	17,978
Other electric apparatus:		
Spark plugs	169,880	69,060
Other starting, lighting, and ignition equipment	53,453	34,200
Insulating material	70,479	26,020
Metal conduit, outlet, and switch boxes	55,407	32,875
Sockets, outlets, fuse blocks, and lighting switches	137,634	99,616
Electric interior lighting fixtures	165,955	83,639
Electric street lighting fixtures	32,120	10,776
Other wiring supplies and line material	114,686	41,112
Other electrical apparatus, n.e.s.	632,843	377,257
Rubber and friction tape	48,327	13,819
Globes and shades for lighting fixtures	39,645	31,845
Glass electric insulators	7,908	4,210
Electrical porcelain:		
For less than 6,600 volts	32,714	15,036
For 6,600 volts and over	63,548	17,011
Carbons and electrodes:		
Electrodes for electric furnaces	99,169	88,737
Other carbon products	43,350	38,477
Insulated iron or steel wire and cable	8,220	1,577
Copper, bare wire	122,545	42,266
Insulated copper wire and cable:		
Rubber-covered wire	51,899	37,465
Weatherproof wire	41,002	9,826
Telephone cable	5,907	4,563
Other insulated copper wire	159,757	28,571
Nickel-chrome electric resistance wire	.....	25,611
Totals	$10,357,108	$6,105,720
11 months ended Nov. 30	$120,833,011	$86,491,724

Aftermath of St. Paul Election

Following recent refusal of St. Paul voters to grant the Northern States Power Company a 20-year extension of its electric, gas and steam franchises (ELECTRICAL WORLD, January 16, page 119), the City Council granted the power company permits to operate for one year. Then the Council discussed movements to curb the privileges of the company, to obtain lower power and light rates and to build a municipal plant for supplying energy and steam to downtown city-owned buildings. The Council authorized a special committee to survey the feasibility of such a plant.

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Upstate New York Merger

Subject to the approval of the New York Public Service Commission, the Syracuse Lighting Company will take over five other companies in the Niagara-Hudson system, it is announced by A. Dean Dudley, president of the Syracuse company, and the name of the Syracuse Lighting Company will be changed to "Central Niagara Hudson Utilities." The companies to be taken over are the Cortland County Traction Company, which supplies Cortland and vicinity with electricity; the People's Gas & Electric Company of Oswego, the Fulton Light, Heat & Power Company and two gas utilities serving Fulton and Baldwinsville.

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Eagle Pass Plant Ready in March

James C. Kennedy, president Central & Southwest Utilities Company, announces that the subsidiary Central Power & Light Company's 16,000-hp. hydroelectric project near Eagle Pass, Tex., part of a development which will irrigate thousands of acres of hitherto barren area in southern Texas, will be completed on or about March 1. All that remains is to place the three hydroelectric turbines and other equipment and complete the power house, Mr. Kennedy said.

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Few Outages on Ontario System

Science and efficient organization have combined to triumph over the forces of nature in keeping the 220-kv. transmission lines of the Hydro-Electric Power Commission of Ontario free from serious interruptions and breakdowns, according to a statement issued from the Hydro office in Toronto. For a period of 23 months from August 17, 1929, to July 29, 1931, there was not a single interruption due to 220-kv. line faults. Up to October 1 of last year there was only one interruption to important loads due to imperfect adjustments, despite the fact that during this period construction was in progress, necessitating frequent changes and adjustments in protective devices and wiring. In the summer of 1931 lightning storms passed over the eastern lines on at least 25 days.

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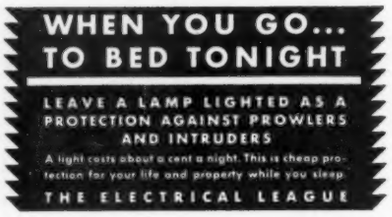
LIGHTING FOR PROTECTION


WHEN YOU GO...
TO BED TONIGHT
LEAVE A LAMP LIGHTED AS A PROTECTION AGAINST PROWLERS AND INTRUDERS
A light costs about a cent a night. This is cheap protection for your life and property while you sleep.
THE ELECTRICAL LEAGUE

By press and radio this admonition is given every day by the Electrical League of Cleveland to the benefit of wiring contractors and lighting-fixture dealers.

▼

Good Run-off Helps Hetch-Hetchy

Heavy rain and snowfall in the High Sierra has caused the Moccasin Creek power plant on the Hetch-Hetchy power development of San Francisco to set a new 24-hour record for itself in power production from the regular flow of the Tuolumne River, and the reservoir behind O'Shaughnessy Dam is also rapidly filling. The city sells the output of the Moccasin Creek power plant to the Pacific Gas & Electric Company, and the revenue from this source has been greatly depleted because of severe drought conditions. Under present conditions city officials are looking forward to a full year's revenue.

▼

Obstacle to Herndon Plant Goes

Dismissal of a suit over riparian rights has removed one of the obstacles in the way of construction of the San Joaquin Light & Power Corporation's proposed 50,000-kw. steam plant at Herndon. No definite date has been set for the start of construction, although early spring has been tentatively mentioned with the object of having the plant ready for operation not later than the summer of 1933.

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Negotiated Rates in New Jersey

Electric and gas rate adjustments which mean a saving of approximately $1,400,000 a year to consumers are listed in the New Jersey Board of Public Utility Commissioners' annual report to the Governor as one of that body's achievements in 1931. The reductions were accomplished by conferences arranged by the board which obviated the necessity of expensive formal proceedings, the report said.

Union Electric Loses to Laclede

Disapproval of the proposed rate schedule for steam-heating customers of the Union Electric Light & Power Company of St. Louis, under which the company sought to restrict its steam-heating service to its electrical customers, was expressed last week by the Missouri Public Service Commission. The commission held that this provision was discriminatory and contrary to the spirit and letter of the public service act. The rates were not changed under the new schedule, the company simply seeking to withhold steam service from customers of other electric light and power companies. The Laclede Power & Light Company, the Union Electric's business rival, opposed the application.

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Keokuk and Mexico (Mo.) Line

The Missouri Power & Light Company has tentative plans for future construction of a high-tension line from the Keokuk Dam in the Mississippi River at Keokuk, Iowa, to Mexico, Mo., to form a junction with the power line from Mexico to Jefferson City, Mo. Mexico is about 100 miles from Keokuk.

▼

Small Consumers Dog in Manger

Small consumers of energy raised such a rumpus because they were not included in the recent reduction of rates to customers of the municipal electric lighting plant at Lincoln, Neb., that the City Council rescinded its action and restored the old schedule ranging from 5 cents down to 3 cents. The Council had taken a half cent off the rates in the two higher consumption brackets, and a drive for big consumers was to be made. The municipal plant's revenues come mainly from the smaller consumers, and as the Council could not reduce their rates it decided to cancel its previous action.

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"Hog Fuel" Unavailable in Oregon

Despite the fact that Oregon sawmills have been idle for one year and the only source for the supply of "hog fuel" has been thus shut off for that length of time, electric utilities in that state which have been using that type of fuel have not applied for authority to increase rates. As a substitute for "hog fuel" the operators have been compelled to burn oil, which is much more costly. The utilities point to figures showing capital outlays for the current year which indicate that reductions amounting to as much as 50 per cent in many instances were found necessary in order to conduct 1932 operations without increasing rates or suffering further loss of revenue.

Oxygen-Free Copper Commercially Produced

High purity, oxygen-free, electrolytic copper is now available for general use as the result of elaborate research and costly development work extending over several years. Radical changes in refining and casting methods make this possible. The commercial production of such copper has just been announced by the United States Metals Refining Company and applies to the output of its Carteret (N. J.) plant.

Wire bars, cakes and round billets for tubes are now available as oxygen-free metal, cast in vertical, water-cooled molds, with precise control of temperature in smelting and casting and exact regulation of casting speed to insure smoothness of surface and freedom from defects. Absence of oxygen in copper castings is one of the main objectives in refining the metal, but in the method commonly used the pure-copper cathodes are melted in a large open-hearth reverberatory furnace. During this process the molten metal becomes saturated with oxygen, which is only partially removed by processing. An important feature of the new-process copper is that it contains no residual deoxidant, but conforms in every respect to A.S.T.M. specifications.

Oxygen-free copper is said to possess higher resistance to fatigue than ordinary electrolytic copper. Physical tests, it is claimed, show increased toughness and ductility, evidenced by high reduction of area as well as by number of bends and twists before fracture occurs. Tensile strength and elongation are about the same as for ordinary electrolytic copper. For deep drawing, stamping and spinning — operations requiring annealing — tests indicate that oxygen-free copper remains "soft" much longer than ordinary copper, making possible a reduction in the number of annealings or avoidance of the annealing procedure.

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Steam Circuit Breaker Interrupts 220,000 Kva.

Overseas developments in circuit-breaker practice have utilized steam and compressed air as the arc-suppressing media with notable success. A recent demonstration at the Baden works of Brown, Boveri & Company, Ltd., showed an interrupting capacity of 220,000 kva. for a 10,000-volt steam circuit breaker and about 150,000 kva. at 16,000 volts for a compressed-air type.

The steam breaker mentioned has a rated capacity of 400 amp. The arc is broken under water in a pressure chamber, and when the movable contact rod is drawn out of this chamber the steam produced by the arc passes into an expansion chamber situated above the pressure chamber. The steam completely surrounds the arc, cooling and de-ionizing it, so that it is rapidly extinguished. For an actual test the power ruptured was 210,000 kva., the current at rupture was 13,000 amp., and the voltage 9.5 kv., while the duration of the arc was two half-cycles, or 0.02 second. The maximum pressure attained in the chamber was 515 lb. per square inch, and the oscillations imposed on the pressure curve have a frequency of 1,000 cycles per second. In the course of the demonstration the circuit breaker was operated several times, rupturing powers of the order of 220,000 kva. at about 10,000 volts, with comparatively little noise. By careful design and investigation it has been found possible to reduce the water loss so that the circuit breaker can be operated many times without refilling.

The compressed-air locomotive-type circuit breaker has a double break and a rupturing capacity of about 150,000 kva. at 16,000 volts, the arc in this case being rapidly extinguished by a blast of compressed air. The circuit breaker is in form of a bushing and is designed for mounting on the roof of a locomotive, the upper part being protected from rain by a porcelain cover. For the operation of the circuit breaker the only requirements are a standard electropneumatic valve and a supply of compressed air at a pressure of about 75 lb. per square inch, so that it may conveniently be employed in other applications, where a supply of compressed air is available. An oscillogram obtained when this circuit breaker ruptured 110,000 kva. at 16,000 volts shows the duration of the arc in this case to have been but 0.015 second.

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Tri-State Power District Inquiry

Governor Meier of Oregon has appointed a special committee of three citizens to investigate the feasibility of setting up power districts in that state, Washington and Idaho. The committee will seek co-operative assistance from similar committees appointed by the legislatures of the two neighboring states and report to the 1933 Assembly.

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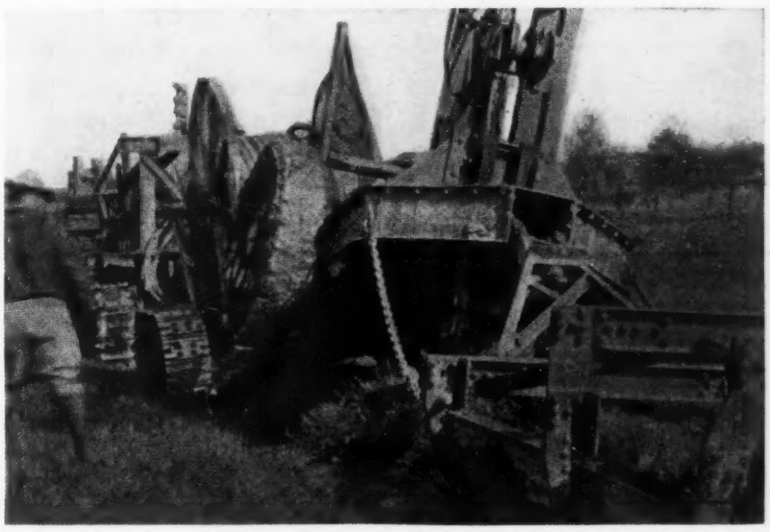
Telephone Cable Laid at Rate of 2,000 Ft. an Hour



What is said to be a record speed in the plow-trench laying of large-diameter cable has been accomplished by construction crews of the New York Telephone Company. A maximum of 21,180 ft. a day was reached and an average of 13,000 ft. a day was maintained in laying the 52 miles of jute-armored cable in the 70-mile line between Syracuse and Watertown, N. Y.

The cable route through open country was first opened by a "rooter" plow, pulled by three 10-ton tractors, which digs to a depth of 30 in. and cuts out roots, rocks and other obstructions. The rooter plow is followed by a cable-laying plow, substituted for the rooter on a similar plow chassis, drawn by the same tractors and carrying, in addition, a cable trailer, on which is mounted a reel of cable which is picked up at regular intervals of 1,000 ft. along the route. The actual operation of laying the cable is accomplished by drawing the blade of the cable-laying plow through the cut made by the rooter plow and paying out the cable into the 30-in. cut as the plow moves along. Behind the cable-laying plow follows a small tractor which flattens the plow furrow, covering the cable as fast as it is payed out.

This is the third installation of the new type of jute-armored cable (no wire armor is involved). The cable carries 200 pairs of wires, affording 300 circuits.

EDITORIALS

L.W.W.MORROW
Editor

Public acceptance of electric cooking

AN INDUSTRY program to sell a million electric ranges in three years has been announced. This involves a total expenditure of about $500,000,000 by households and an advertising program costing about $12,000,000 by the electrical industry. The sale of these ranges will benefit every unit in the industry, and the program should have the full co-operation of all its branches.

There are plenty of negatives involved in a program to induce this country to accept electric cooking to the same degree that it has accepted the electric light and the electric refrigerator. But negatives are not constructive and do not help progress. All the negatives should be discounted and the final truth kept in mind—if the people are convinced that electric cooking is the best method, they will demand it and will use it. In the older days there were negatives in the program for selling the electric light, and in recent days only has electric refrigeration become popular. Thus the first step in the range program, and the essential step, is to make the people of America conscious of electric cooking as the best, the most modern and the popular method for cooking.

Back of the development of public acceptance and consumers' demand lies the distribution and sales mechanism of the industry. This should be developed by applying the best principles of merchandising, whereby each unit in the industry will develop a profitable business. The product is splendid, public acceptance and demand can be had, and only poor business conduct can bring loss and failure to any participating enterprise.

Electric cooking is the immediate business opportunity for the electric industry. It deserves and should receive the active support of that industry. Unselfish co-operation will make the program a success, and now is the time to start on a basis of enthusiasm and with a vision of what national electric cooking will mean.

Receivership not a death knell

THAT there have been a few small receiverships in the power and light industry recently should work no injury to the credit of the industry as a whole. Unfortunate as are such occurrences, they frequently represent a salutary way out of a situation for which the executives of the company concerned are not wholly responsible.

Receivership is sometimes popularly confused with failure or bankruptcy. On the contrary, it is usually the most advantageous means of bringing a company through a period of stress and placing it once more on a sound footing. As already implied, the stress may be due largely to external conditions. Some or all of the receiverships recently announced were attributed to inability to finance in existing unsatisfactory markets.

Receivership procedure aims to conserve assets and restore liquidity. Frequently a paring down of capital structure makes possible the almost immediate earning of fixed charges. From the standpoint of the security holder receivership is sometimes highly beneficial. Senior securities usually more than discount the equity loss in advance of the receivership, so that adjustment of capital structure may easily improve the status of the holders of senior securities. Some of America's largest institutions have passed

through receivership. In the case of recently announced receiverships in the utility field reorganization is reported well under way.

What should be done with the S.E.D.?

NEARLY nineteen years ago a group of progressive spirits representing the various branches of the electrical industry held a conference on one of the islands in Lake Ontario and established the Society for Electrical Development. Every electrical man has heard about it. It was an effort to set up a co-operative program for the advancement of the electrical idea and the electrical market, founded on the belief that if the power companies, manufacturers, wholesalers, contractors and dealers would work together more could be accomplished than by unco-ordinated effort. It was a sound theory and a good plan.

But the career of the S.E.D. has been marked by many tribulations. The average man seems to believe co-operation means that others should help him with what he wants to do and in the way he wants it. Too few realize that to enjoy the benefits of co-operation in those matters which contribute to the common progress each group must sacrifice something of its individual freedom of opinion and initiative. Men who head companies and habitually exercise authority are often hardest to convince. And so the society has had many enemies. But it has had still more friends.

Yet, though it has written into the story of industry progress an honorable record of achievement, it has been prevented from accomplishing many constructive purposes advocated with enthusiasm by electrical men who had the vision, because of the opposition of other industry associations or the obstruction of individuals who could not bring themselves to give as well as take or to break the habits of tradition. Thus the S.E.D. has been often in trouble and several times has balanced on the brink of dissolution—and there it stands today.

So the question is up again, Should "the society" be continued or dissolved? But the issue goes behind that. The real question is, Should there be co-operation in the electrical industry? Should the promotion policies and plans of the several national associations be co-ordinated so that they can pull together? Should local electrical leagues continue to be operated to harmonize the interests and activities of power companies and dealers? If the answer is "No," let the S.E.D. die. If it is "Yes," then let it go forward.

If the society is killed, it will not be long before another organization will have to be set up for the same purpose, because an industry with so many parts, with such conflicting interests, must be held together. The S.E.D. directorate, of which presidents and managing directors of the four major associations are members, was set up to be a forum for the consideration of industry policies. It has never functioned as such. But now is the time such leadership is needed, and there is no better issue for it to settle than this question of abandoning the S.E.D.

Energy loss in distribution copper no longer negligible

BECAUSE of the low load factor in secondary circuits fed by most distribution feeders, the twenty-four-hour energy loss in such feeders, transformers and secondary circuits has very properly been considered negligible. The size of copper used, therefore, has been determined by what has been considered the maximum allowable voltage drop rather than by any loss limit. This has been especially the case with feeders running to residential sections where the load factor is extremely low.

Now, with the improved load factors that are gradually resulting from the use of electrically driven household devices, especially refrigerators, ranges and water heaters, this loss begins to be appreciable and, inasmuch as load factors much higher still are looked forward to with confidence, consideration should be given to it. The present is a very favorable time to do this, as copper is now so cheap that one can well afford to invest with reference to future returns. General increase in the use of underground feeders and networks tends to make a liberal use of copper desirable as the copper cost is so much smaller a part of the total investment than is the case with overhead lines. In many cases doubling the copper used would add but a small percentage to the

total cost. The copper loss in the transformers should also be considered, but this is usually so small compared with that in feeders and secondary networks as seldom to call for any change in practice other than the reduction that automatically results from the larger and larger average sizes used in modern layouts.

The relatively large budget allowances for distribution construction which the operating companies have made in their 1932 plans show that many see this liberal use of copper to be, under present conditions, an excellent investment. It might be well, however, to look over the figures once more and ascertain whether a still more liberal use of copper, in view of the load factors that are sure to be attained before long, would not evince good engineering foresight.

Economize by modernizing stations

REDUCTION in system losses and in operating expense does not mark the end of possible economies in utility systems. Major economies can now be had by spending money to modernize or rebuild existing steam stations. Nearly all stations built even five years ago are now obsolete from a dollar point of view, and older plants could be rebuilt today with very large earnings for the capital expended.

In many localities an old station can be replaced with a 600-pound steam plant using modern high-rated equipment to operate at about 12,000 B.t.u. per kilowatt-hour at normal load factor. The first cost will range from $65 to $80 per kilowatt. These figures may well be compared to the 17,000-B.t.u. station of five years ago, with a cost of $100 to $120 a kilowatt, to the very great economic advantage of the rebuilt station.

With a permanent station site and an adequate building the cost of rebuilding an uneconomical station decreases still more. It will pay many properties to study an economic balance sheet for steam plants, and many instances will come to light where a major saving in generation will result if modern prices and modern practices are combined to make an old station modern. It should also be kept in mind that station practice appears to be well standardized for the next few years, so that stations built now have no obsolescence clouds on the horizon.

Customers, not companies, dominate in merchandising

IT IS highly desirable from the standpoint of community amenities that the relationships between utility companies, local merchants, department stores and manufacturers' branches and outlets be both co-operative and fair. That such amenities should be preserved and fostered is a matter of course, and at scores of gatherings of electrical men it has been emphasized. But the ultimate object of commerce and trade is profits, and these depend upon the proclivity of the potential purchaser to buy.

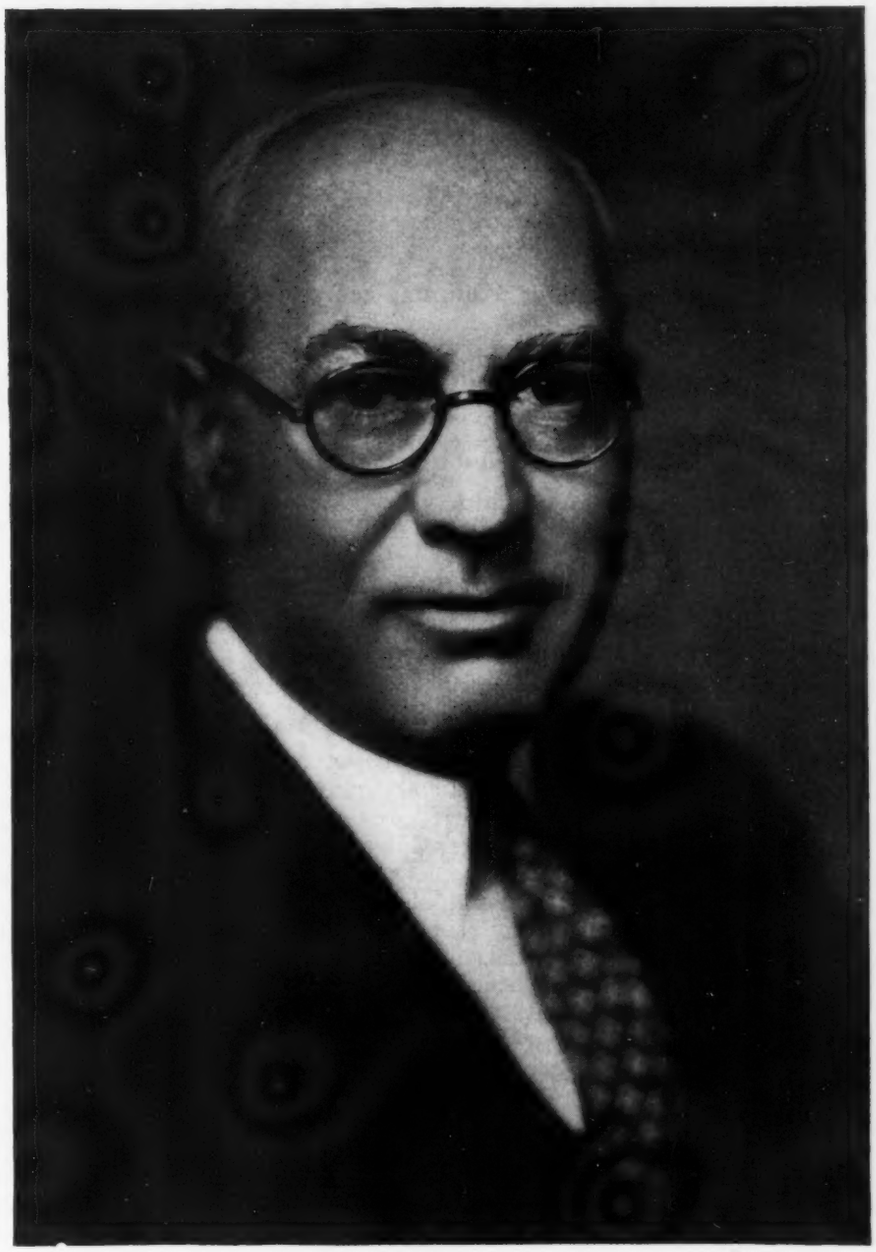
It has yet to be proved that the buyer of goods, whether these be clothing, furniture, collars, electrical appliances, razor blades or bread, cares one tittle this way or that whether the local dealers in such commodities speak to each other as they pass or whether they look upon each other as trade rivals who are price cutters, unfair merchandisers or menaces to business life.

The ultimate consumer is interested in obtaining for his dollar the greatest value in exchange for some article for which he has a desire or need. The merchant, be he Tom, Dick or Harry, who has satisfactory goods at the best price and with such service conditions as are most acceptable to the potential buyer has the best prospect of making the sale.

Desirable it may be to keep prices at an established retail figure so that there shall be no discrimination between purveyors. Admirable it is so to conduct trade relationships that amity rules. But these are likely to be highly artificial conditions attained at the sacrifice of the customer's participation.

In fact, it might be far better to have bargain sales and special sales in electrical appliances, to develop marketwise competition for the customer's dollar and to stimulate a great potential market rather than to let such a buying power stagnate while so-called merchandisers quixotically debate and ceremoniously indulge in delicate observances of ethics.

All extremes are untenable. It requires a nice sense of balance to work out bad or dangerous situations successfully, but whatever be the compromise, no plan which overlooks the psychology of the individual as a buying element can ultimately succeed or reach its full development in the marts of trade.



Harry Reid

FROM part proprietorship of a small dusk-to-dawn electric generating plant at Versailles, Ky., serving a population of 2,250, to the presidency of the National Electric Power Company and the National Public Service Corporation, two of the largest units in the Middle West Utilities system of the Insulls—this represents the business progress of Harry Reid in the last quarter century. His concurrent progress as an active participant in electrical association work brought him last year to a vice-presidency in the National Electric Light Association, with presumptive accession to the presidency in 1935. He had before this been chairman of the Public Relations National Section for two terms.

Mr. Reid has been especially prominent as a leader in the movement to integrate small local plants into interconnected systems serving widespread areas. He became sole owner of the Versailles plant and with it as a nucleus gradually put together a group of companies which in 1912 became part of the Middle West Utilities system and were organized with other companies into the Kentucky Utilities Company, of which Mr. Reid became president. From 1912 to the present he has been one of the leading executives of the Middle West Utilities. In 1917 he left Kentucky for Indianapolis to serve as president of the Interstate Public Service Company of Indiana, and he remained in that city ten years.

Early in 1927 Mr. Reid became the executive head of the two Atlantic Coast companies named in the first paragraph, which had just been acquired by the Middle West Utilities system. These two companies, now known as the "National group," represent public utility holdings in fifteen Eastern states, extending from Maine to Florida and westward to Michigan and Ohio. Through his association with this group Mr. Reid holds the position of president, board chairman and director in more than 50 other companies.

Mr. Reid was born in Johnstown, N. Y., in 1879. His education was received in local schools, followed by a business college course. In 1896 he entered the office of a Johnstown lawyer, remaining there for five years. But his destined field lay elsewhere, and in 1901 he left the law office to take his first public utility job with the Fulton County (N. Y.) Gas & Electric Company.

Trade Relations and Appliance Marketing

Dealers would suffer if utilities cease merchandising.

Utilities must establish the standards and set the pace.

Consumer acceptance must be created.

Distribution plan should vary with products sold.

By T. K. QUINN

Vice-President General Electric Company

A COMBINATION of circumstances will in all probability further focus the attention of the electrical industry on the sale of home appliances during the year 1932. The public utility companies will undoubtedly think even more of the domestic load. Product and price changes and keener competition will stimulate greater activity in the field and manufacturers may be depended upon to exhaust every resource in the production of new, attractive devices. Competitive conditions will probably be more, rather than less, difficult.

Looking back, it appears that the mistakes of a few companies helped to arouse a dormant trade antagonism and led to unreasonable proposals for eliminating them entirely from the field of appliance merchandising.

We did not all foresee that a spark in one state could start a fire in many others. Now the agitation has become so strong that there is danger of an all-too-rapid trend. Manufacturers, jobbers, dealers and all branches of the industry have a definite interest in the continuation of merchandising by the electric public utility companies. Practically all the pioneering of new appliances has been done by them. No other retailer can do the educational work as well or have an equal interest in the development of the whole industry.

Sales evolution follows rule

The sales evolution of all home appliances and their growing popularity is quite similar. In the beginning the language is too technical, the use is not known, the consumer must be enlightened as well as sold, and the selling costs are high. If the industry was willing to wait long enough, the consumer would in the course of years discover the article and buy it, but we are not now tuned to such slow progress. The utility company shoulders the burden long before the dealer is qualified to carry it, from any standpoint. After a consumer demand is created the jobber and the dealer enter the field, as the utility company should be glad to have them do. In the case of a few appliances, the electric refrigerator, for example, a marketing method was adopted almost from the beginning which made the whole business self-sustaining and provided a place for the specialty dealer. The comparatively higher unit price and the wide potential market made this possible. The same methods cannot be followed where the market is more limited or the unit prices substantially lower.

If in response to shallow clamor the utility companies should tire of explanations and leave the field, no one would suffer more now than the independent dealers.

The easiest way of quickly introducing new appliances would be gone and it would hereafter take many years to accomplish what we now do in a year or two. The independent dealer must learn that in return for this service, aside from the right of the utility to be in the merchandising field, it should be welcomed as a competitor, not only on new specialties but on related lines which must be carried to support the whole activity. But the competition should be fair and the methods beyond reproach.

Incredible as it may seem at this late stage of the game, we still find some utility companies, with every good intention, following practices and policies which will almost surely create ill will in the trade. Wherever it is the aim and purpose of intelligent policy to encourage the retail sale, through dealers, of the maximum quantity of useful home appliances, every department in a utility company should be brought into harmony with that policy. It is not enough to make a statement of good intention and then leave the influencing commercial managers' compensation dependent solely on the utility's own sales and nothing else. They should not be asked to steer a course between their own personal progress and pocketbooks, on the one hand, and the larger purposes of their company, on the other. These two things should be brought together and made one. The man who must represent the company to the trade and the public should be paid for doing exactly what the company wants done without divided purpose or any motivation except the good will of the company as a whole.

An executive declaration of principles is a good start, but unless the subsequent actual practice and every detail of it can be at least as fairly competitive as the statement is commendable, it had better not be issued at all.

On the other side of the question, we find some companies going to futile extremes in an effort to please every one. The revision downward of their own direct

salesmen's compensation to make them less intent upon the individual sale is a disappointing move, which in the end benefits no one. Even the dealer who must be coddled to some extent does not expect to have the way made easy for him in this manner. Salesmen must be paid and paid fairly, regardless of any trade condition. But the people who work with dealers and who decide upon the extent of co-operation with them should be paid on their results in that direction and not only upon their own competitive sales.

Above everything else, the independent dealer is most inflamed when he is undersold, particularly by a large competitor who he feels has unusual advantages. Giving premiums, or large trade-in allowances, or better or longer terms or discounts, or specials of any kind, are all different forms of the same thing—price cutting. More than this, it is better for the central station to go to the other extreme and handle only the best and highest-priced appliances, leaving the dealer free to handle inferior lines if he will, with price advantages.

From the dealer's viewpoint it is not simply an economic question. It is not so much a matter of restraint on the part of the utility from doing what it can or cannot afford to do, even on a separate merchandising profit and loss basis. The real point is that the dealer protests any terms, service or price which he—the dealer—cannot give. Witness the fight now in progress between the independent dealers and the chain and department stores. The larger stores would be in the same uncertain position if they were utility companies of a quasi-public nature.

It is distinctly up to the central station in the merchandising field to establish the standards and set the pace.

Example is the best precept with the small dealer who must not be expected to be more ethical or to sell at higher prices in a more legitimate way than his pace-maker—the central station.

Under no circumstances should the central station undersell the dealer in any one of the dozen or more devious ways of cutting prices.

Remembering that the dealer is more likely to follow than to lead, the central station should certainly not handle inferior quality or non-standard merchandise items simply because the purchasing agent can get a better price on them.

Public utility companies, like department and chain stores with larger requirements, may usually buy at lower prices. The Clayton law expressly provides for lower prices to the quantity buyer. It does not attempt to regulate the relative price advantage based upon varying quantities. Manufacturers are so attracted to large orders that they are sorely tempted to, and, in fact, too often do, yield price ground. The result is often an advantage for the large buyer over the small one which cannot be economically justified. It permits the large retailer, notwithstanding his higher percentage cost of doing business, to undersell the small retailer. Large department and chain stores frequently do so, but utility companies, which must maintain cordial trade relations, cannot afford to and should not.

Utilities should set pace and maintain standards

Beyond this, the public utility companies have so much to gain through the maintenance of standard prices and products and the upbuilding of the retail electrical trade that they should not only prohibit price cutting in their own merchandise sales departments but should actively discourage it everywhere. To be most conservative and serve their own interests in the most enlightened way they should be the foremost advocates of standard prices on electrical appliances throughout the industry, constantly preaching the gospel and helping to sell the idea that the electric service of a refrigerator, washer, cleaner, range, etc., is well worth the cost.

It must be clear to any one who will think of it for a moment that the stronger the price level the more profitable the business is to the dealer. This automatically encourages more dealers and more selling, which leads to greater domestic load. The need of the moment, particularly on specialties like the range and water heater, which have attained only a limited degree of consumer acceptance, is more and better salesmanship.

The large retailers, department stores, etc., are perfectly articulate. They are able to make their position clear on electrical merchandise to the utility companies. But having settled this much, the story is only partly told. What of the small retailer, who under favorable conditions may be enlisted as an energetic specialist to sell all appliances, and especially the relatively new, major current-consuming devices. He is less coherent, but feels deeply and registers his complaints in petition signatures and votes.

Department and chain stores are organized to do a demand business. They depend chiefly upon newspaper advertising and traffic and display for their sales. They do not, broadly speaking, create demand for new electrical products. This responsibility is now and has been accepted by the electrical industry.

From the standpoint of the industry as a whole, it is not even enough to create fair and equitable retail sales policies and practices. The whole success of appliance sales is not bound up in the single proposition of retail price. Where the use of a given device requires a change in the habits of the consumer, large national campaigns and all the modern means of sales promotion and advertising must be adopted.

It is the exceptional retailer or utility company that properly estimates the value, strength and effectiveness of national advertising and publicity. One of the industry's most pitiful spectacles is the uphill effort and excessive sales cost of a purely local campaign to sell an appliance for which little or no national backing has been provided. These same excessive costs are often presented to the manufacturer of nationally advertised products for which there is a consumer demand as a reason for requesting larger gross profit margins.

Any well-conceived plan of electric appliance merchandising must take into consideration the manufacturer as well as the consumer and every link in the distribution chain—jobbers, small and large dealer, department store, chain store and central station.

The manufacturer cannot escape responsibility for failure to provide the necessary trade profit margins in establishing list prices any more than he can escape responsibility for inferior product quality. But the selling cost of an accepted device manufactured by a well-known company in which the buyer has confidence is very much less.

Fair profit margins depend also upon the nature of the product, type of selling required and the amount of the unit price. All other things being equal, the percentages may be less as the unit price increases. If direct house-to-house salesmen are required the percentage gross profit must, of course, be greater. It is somewhat easier at this point in the development of the market to sell a cleaner or a refrigerator than it is to sell a water heater.

Distribution plan varies with products

The kind of selling plan and distribution method employed will vary according to the article in question. Cigarettes and razor blades, tooth paste and soap require very wide distribution. Sales may be in direct proportion to the number of retail outlets. This is not only because the unit price is low but because purchases are frequent. The consumer goes to the nearest and most convenient store, as the purchase is not an important event. Where thousands of retail outlets must therefore be employed, the jobber provides the economic function of serving the dealer who buys from him with a number of lines of sufficient total value to warrant close contact, salesmen, etc., which a manufacturer or central station could not afford on one or a limited number of items.

In the electrical appliance field we have some purely demand or convenience type articles, but at the other extreme we also have distinct specialties requiring intensive rather than extensive selling. From the standpoint of required marketing method an electric refrigerator is more like a piano or an automobile than it is like a "Mazda" lamp. Yet we actually see continued efforts made to ignore these economic considerations within the industry and to attempt sales of all appliances in exactly the same way or, what is worse, to treat the distribution and sale of an electric iron as though it was a washer or a range or a cleaner.

All these and many more complex factors tend to confuse our efforts in the approach to the 1932 electric appliance market. The struggle for dominance among manufacturers who have a permanent place in the industry, and attempts by others who may have no permanent place in it, serve only to add complications. Dealers, particularly large ones, who recognize no loyalty to the electrical industry and perform wholly as opportunists are a constant threat to stability. They and others sing siren songs to gullible buyers and help to boost the utilities' service costs by selling butterfly devices on the lines, and very often the manufacturers who produce them are actually favored by their own victims.

There is great room for improvement in the electric appliance sales field, and perhaps the added attention it will hereafter receive will uncover some of the weaknesses. The total volume of business in 1932 should be at least equal to 1931 and probably greater, even though general conditions show no great improvement. Even the ladies who return to old-fashioned housework will be good prospects. They will prefer electric cleaners to brooms, washers to scrub boards and electric irons to sad irons.

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Factors Affecting Welding of Alloy Steel

By WILLIAM SPRARAGEN

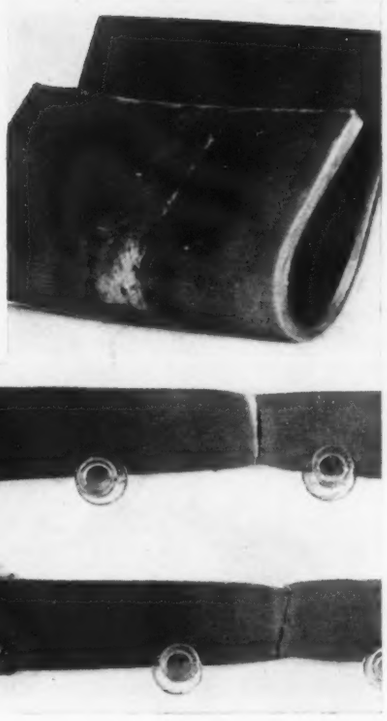
Secretary American Bureau of Welding, New York City

Of the large variety of alloy steels now on the market under various trade names, some may be readily welded, and others with considerable difficulty. In general, the chrome-nickel alloy steels are more readily welded, whereas the chromium alloys which do not contain nickel in appreciable quantity are more difficult to handle. As with ordinary steels, the alloys that have less than 0.20 per cent carbon are more readily welded than those that have a higher carbon content.

Certain physical properties of the chrome-nickel alloys with less than 0.2 per cent carbon must be taken into account in welding operations. Some of these alloys possess only one-third of the heat conductivity of ordinary steels, while at the same time they have an expansion coefficient about 50 per cent greater than that of steel. It is these properties that cause the greatest difficulty in welding alloy steels belonging to this group. Expansion must be carefully controlled. The use of suitable clamps and jigs is often necessary for successful welding. Backing-up strips of heavy copper slabs with or without the aid of water cooling assist materially in keeping the temperature down and therefore lessening the expansion of the material. The use of lower heat values in welding, as compared with steel, is also a necessity. As indicated later, rapidity of the welding operation is very desirable.

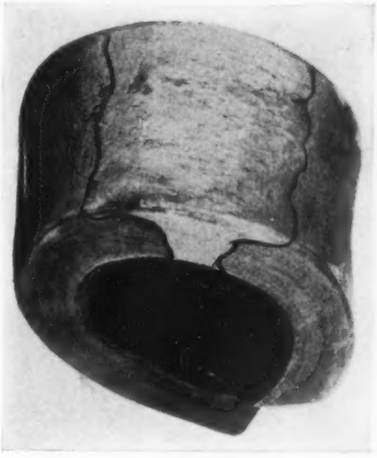
Generally welds and adjacent material in this class of alloys are ductile and require no subseqent heat treatment. The addition of about 1 per cent each of manganese and silicon apparently improves the welding quality. However, for very severe service, subjected to corrosive fatigue action, heat treatment will remove any strains and therefore raise the endurance limit under these conditions. Annealing also serves to increase the ductility and tensile strength.

Welds made with this class of steel would have a tensile strength ranging from 65,000 to 75,000 lb. per square inch, with a corresponding yield point of from 50,000 to 60,000 lb. per square inch and an elongation of about



Tensile and bend tests on 18 per cent chrome, 8 per cent nickel, 0.25 per cent carbon

Good ductility in both tensile and bend.



Tensile and bend tests on Enduro KA2S

Welded with Maurath coated Enduro KA2S electrodes. Note exceptional ductility in tensile test and across weld in bend test. Tests made on ½-in. plates welded with two beads from each side.

15 per cent in two inches. Welds of even greater tensile strength and ductility have been produced.

The annealing temperature would be dependent somewhat on the material, but would be of the order of 1,750 deg. F. to 2,100 deg. F. In contrast to ordinary iron and steel this annealing temperature should be attained quickly and the material also cooled rapidly. Quenching in water is recommended for small articles.

As indicated previously, this group lends itself most readily to welding and the author recommends the use of steels falling within this classification wherever possible.

For arc welding of these corrosion-resisting steels a coated welding rod is an absolute necessity. Reverse polarity is employed because the electrode is made the positive side and the work the negative terminal. To avoid magnetic disturbances the work should be so arranged that the direction of welding will be opposite from that in which the current is flowing. The welding machine should be regulated to give the following currents:

Thickness of Material (Inches) Light Gage	Size of Rod (Inches)	Current (Amp.)	Layers
	5/32	35– 40	1
1/8	1/8	75–100	1
5/16	1/8	75–100	1
1/4	5/32	100–125	2
5/16	5/32	100–125	2
3/8	5/32	100–125	2 or 3
1/2	1/16	150–175	3

Because of the higher electrical resistance of the work and electrode, it will be found necessary to use a somewhat larger open circuit voltage than would be necessary in the welding of steel to give the currents indicated in the above table. The technique of welding is also somewhat different than that of steel. The welding should be completed as quickly as possible to avoid raising the temperature of the work any more than necessary. Puddling of the metal is undesirable as it tends to hold it in a molten condition for a longer length of time, coarsens the grain structure in some of the alloy steels and involves expansion difficulties in the chromium nickel steels.

As indicated in the table, the number of layers, to secure a good cross-section of weld, is larger than that in steel, as it is desirable to employ several heads one on top of the other, rather than attempt to lay a very heavy bead at one operation. The annealing effect of the subsequent layers is also very desirable. It is important to remove all slag formation by scraping, wire brushing or with an air hammer and blunt tool before laying succeeding beads. In welding thick plates the edges should be beveled in a manner similar to that employed in welding ordinary steels. It is desirable even to remove the slag on the last layer because foreign substances may start corrosive action.

A flux coating serves to produce a reducing atmosphere surrounding the arc, thereby minimizing oxidation and enabling the operator to produce a sound deposit free from porosity. The coating should be free from carbon to prevent the absorption of this element, which would reduce the corrosion-resisting qualities and in some structures give a hard weld deposit. Manufacturers generally recommend a coated wire of the same chemical composition as the work being welded.

Satisfactory welds have been produced with a carbon arc shielded by a hydrogen atmosphere in many of the alloy steels. The same precautions and general remarks concerning annealing are also applicable. The usual mixture of gases is: Nitrogen, 75 per cent; hydrogen, 25 per cent.

Wiring, Rates and Appliance Prices

The principal reason wiring in general is not adequate is that adequacy has not been sold. It is not contended existing rates are too high, but that their form is not calculated to encourage the most liberal use of energy, which must result in a lower average rate to the consumer. The prices for energy utilization equipment may not be too high for the present demand, but are they not too high to permit universal acceptance and use of them by the average housewife, who perhaps needs them most?

MARSHALL E. SAMPSELL

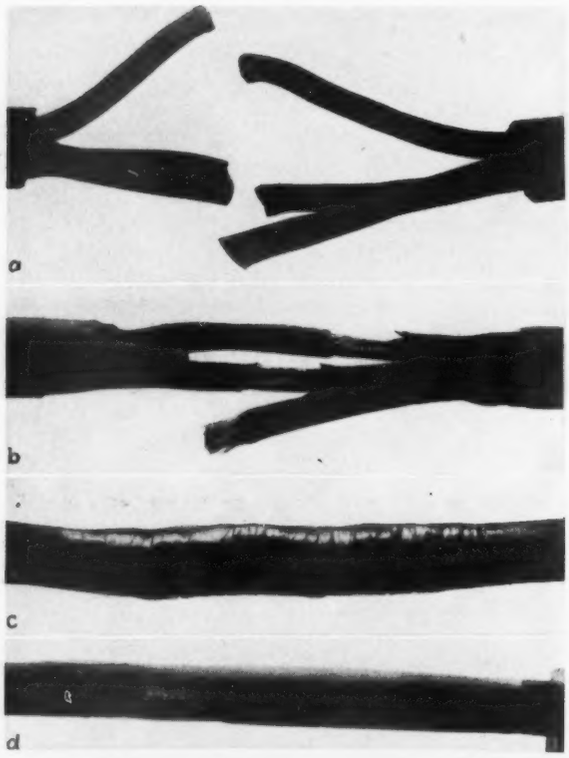
Rubber-Covered Drag Cables Repaired by Vulcanizing

Hard service for cables

Carrying power to electric channeling machines, lying among rubble and in water puddles on rocky ledges, portable cables have a hard life.

Nearly 9 miles of rubber-covered drag cable delivering 230-volt, three-phase power to channeling machines and other portable equipment in the sixteen completely electrified producing quarries of the Indiana Limestone Company constitute a maintenance problem of considerable proportions, according to J. F. French, electrical engineer Indiana Limestone Company, Bedford, Ind. To be exact, the problem embraces 18,100 ft. of three-conductor cable in Nos. 6, 4, 1 and 1/0 sizes and 26,000 ft. of single-conductor No. 4/0 and 300,000 circ.mil, all insulated for 600 volts. These cables lie on the floors and ledges of the quarries, frequently in water puddles, and are continually being cut or bruised. At first, cable repairs were made in the field, but the joints and cut fills made with tape and insulating compound would not stand up under the constant dragging over rock ledges and through pools of water.

All cables are now repaired by vulcanizing, just like a tire casing, in the central repair shop, to which damaged cables are sent from all the company quarries. A sufficient number of spares prevents shutdown of any machines. The vulcanizing machine was designed and built by



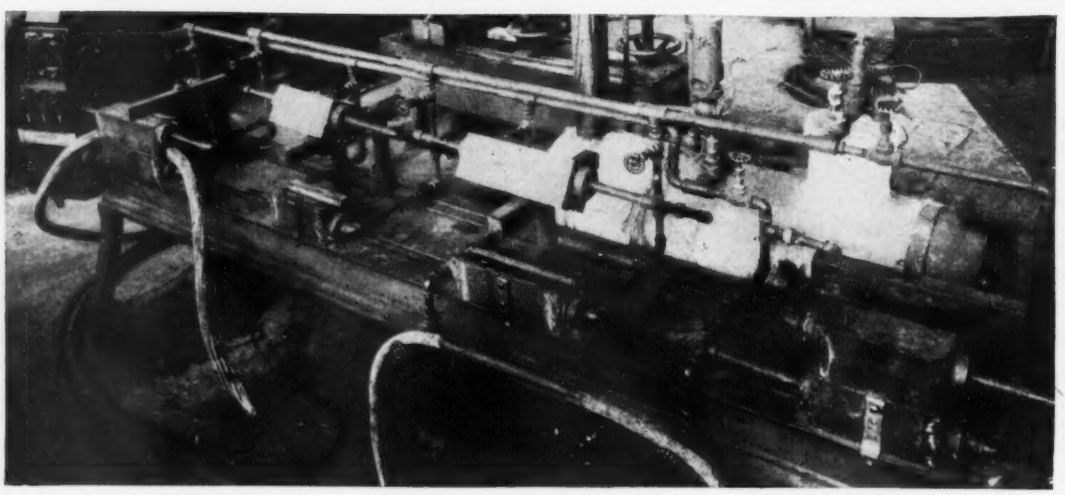
The process of repair

(a) Although only one conductor may be damaged, all three are cut so that no one will be shorter than the others in the finished joint. Insulation is scarfed back 6 in. on each side.

(b) Staggered so the joint will be smooth and insulation between phases maintained butt splices in thin-rolled copper sleeves about 1½ in. long are made in each conductor.

(c) After each conductor is individually insulated, the joint is built up with standard 1/16-in. gage black rubber tire tread stock with a shrinkage allowance for vulcanizing.

(d) And after a few days' exposure to service conditions the splice is hard to find.



Four splices at a time

Each splice is baked for one hour under 65 lb. steam pressure.

men in the shop. The process is illustrated and explained in the accompanying pictures. A greatly lowered cost of maintenance and a lessening of outage time of quarry machines have resulted from the new method. The average unit cost per splice for No. 4, three-conductor cable is $1.50, considerably less than the cost of a tape and compound joint. Cable life has been increased and electrical troubles caused by cable grounds reduced.

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Considering Old Eyes in Lighting

By M. LUCKIESH
Director Lighting Research Laboratory, General Electric Company, Cleveland, Ohio

When the value of higher levels of illumination is appraised upon a basis of its benefits to human beings in general, many important contributions to individuals are not emphasized and often not even recognized. In scientific researches which establish the relationships between lighting and seeing the subjects are usually young persons with normal eyesight. Hence, the levels of illumination indicated as "adequate" for certain types of visual tasks by these experiments are frequently inadequate for older persons and for those with defective vision. It is emphasized that the term "adequate level of illumination" implies a compromise between factors of economy and visual desirability.

If, for example, it is assumed that 20 foot-candles represents at present an economic level of illumination for reading black print on white paper by normal young eyes, the levels of illumination required by older normal eyes may be estimated for the same degree of lighting effectiveness. As the eyes grow older the pupils gradually undergo a reduction in size, and consequently the brightnesses of the retinal images decrease, although the level of illumination upon the objects to be seen remains the same. In order to maintain the same brightness of retinal image the level of illumination must be increased for the older eyes.

The following table indicates the progressive change in the size of the pupil with age, the relative brightnesses of the retinal images and the levels of illumination required at various ages to produce the same lighting effectiveness as 20 foot-candles produces at an age of 20 years.

Age	Pupil Diameter (in Daylight) mm.	Relative Brightnesses of Retinal Images	Foot-Candles for Equal Effectiveness
20	4.7	100	20
30	4.3	84	24
40	3.9	69	29
50	3.5	55	36
60	3.1	43	46
70	2.7	33	60
80	2.3	24	83

It is evident from these data that older eyes require much higher levels of illumination than do younger eyes. Furthermore, these data are extremely conservative, since they are based entirely upon the factor of decreased pupil size. The consideration of other factors, such as the gradual loss in power of accommodation, involves additional evidence of the need of higher levels of illumination. The foot-candle values in the table do not take into account the decreasing effectiveness of the foot-candle as an aid to seeing as the level of illumination is increased.

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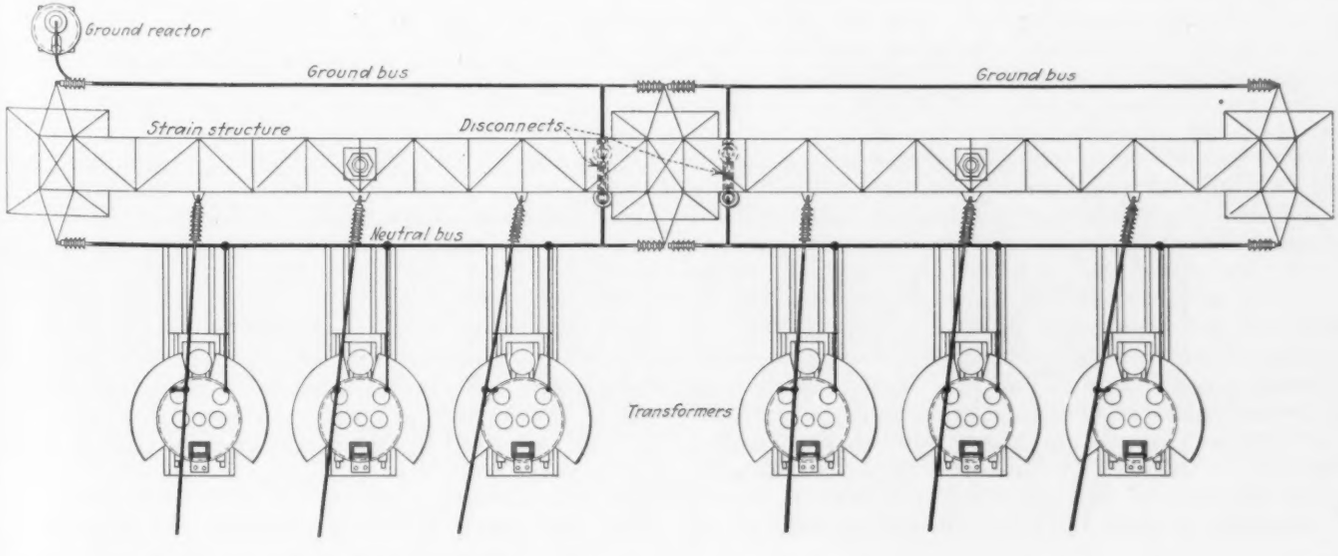
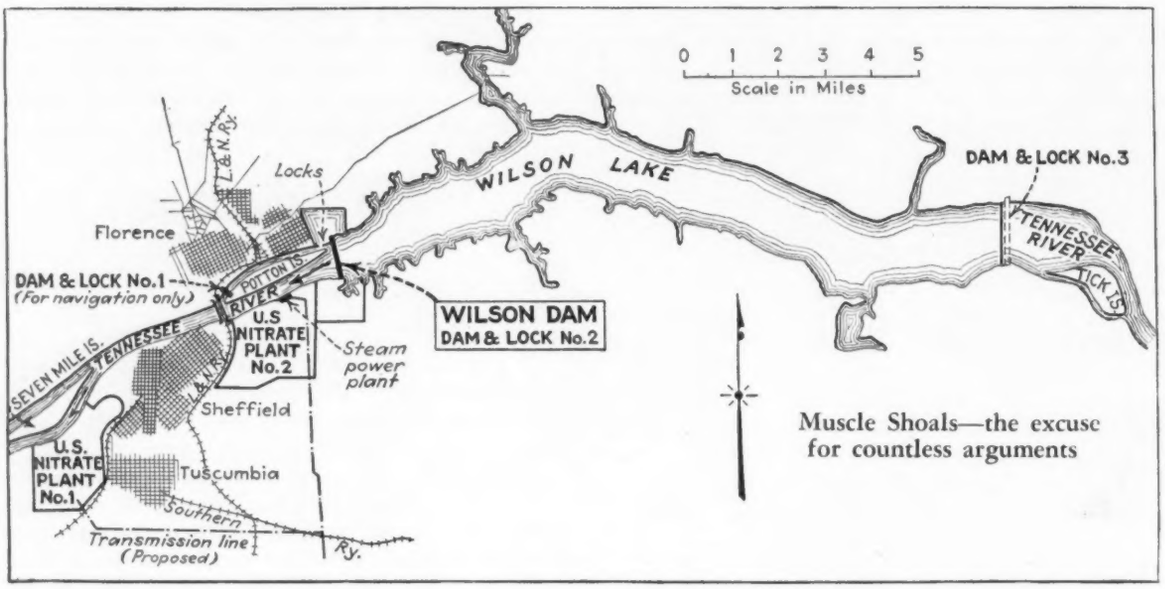
Economy of Copper vs. Apparatus

Using copper conductor to extend the radius of usefulness of a particular piece of apparatus is usually much less expensive than repeating the apparatus in every place where it might be called upon to function. This more economical course was chosen in the neutral ground connection of the two transformer banks that step up to 132 kv. the output of the new Harding Street station of the Indianapolis Power & Light Company, designed by the Management & Engineering Corporation. As may be seen in the drawing, which shows only the input end of the substation, the two transformer neutral buses are separate, but are connected by disconnecting switches to the ground reactor bus that parallels them. Thus one reactor serves both transformer banks, a length of conductor eliminating the necessity for another reactor.





Muscle Shoals Rededicated to Fertilizer and Power Production

DISPOSITION of Muscle Shoals by lease, with fertilizer concentrates as the prime objective of operation, is the recommendation of the Alabama-Tennessee-U.S.A. commission appointed jointly by those states and President Hoover. The report of the commission confirms the frequent assertions that the steam plant and the fertilizer-producing equipment are obsolete and millions would have to be spent to bring the project to economic fruition and productiveness. Government operation is frowned upon as sure to entail in the next fifteen years a total loss of $40,000,000 to taxpayers, with only an $18,000,000 saving to local consumers by comparison with tax-paying utility rates of the vicinity. The implication here plainly is that government operation would involve the further tie-up of millions of federal money and an annual deficit of $2,500,000, with nothing in return but the hollow satisfaction of excluding economical and efficient private enterprise from making the most of the nation's white elephant.

Dedication of the project to agriculture as a matter of national consent motivated the commission throughout its study. The rest of its aim was devoted to reconciling its proposals with the original intent, the present state of scientific and engineering knowledge and the best interests of the two states principally involved, namely, Tennessee and Alabama. Muscle Shoals was built to derive nitrogen by fixation and cyanamide. But nitrogen for fertilizer purposes can now be purchased at less than the cost of making it at Muscle Shoals. On the other hand, the arts of making phosphoric acid in electric furnaces and making fertilizers of high concentration of plant food values have forged ahead. These developments, in the opinion of the commission, offer a hopeful solution for the utilization of the wartime outlay. The U. S. Department of Agriculture, however, minimizes the potential values of the fertilizer facilities.

Lease to private fertilizer enterprise and disposal of surplus power for other industries and general local consumption through utility channels are thus the proposals of the commission. The scheme avoids further outlay of government funds except in so far as they are involved with flood control or navigation and, on the contrary, it provides for a reasonable return on the money already sunk in the enterprise.

Fertilizer production the prime objective

Convinced that nothing but fertilizer production should be given dominant attention, the commission proceeded to look into all ramifications of that industry from the standpoint of raw materials, processing costs, demand, supply, here and internationally. At the outset the nitrate plants are recognized to be needed no longer for military purposes. Plant No. 1, the direct synthetic ammonia plant, is hopelessly out of date. From the fertilizer standpoint only the cyanamide plant (nitrate No. 2) need be considered. Thirteen years of rapid chemical progress have largely destroyed its value in the nitrogen industry, but it can be used to produce concentrated fertilizer with as high as 55 to 75 per cent of plant food content. The average content of fertilizer sales is now 17 to 18 per cent. Germany leads in the high plant food fertilizers, importing American phosphate rock and return-

- Utter folly of government operation demonstrated by Southern joint commission.
- Fertilizer concentrates can be made profitably.
- Government should develop Cove Creek for power and flood control purposes.
- Private utilities should buy power surplus and develop rest of river under federal license.

ing the finished product here at prices below those for the locally produced product.

Germany, France and the United States, with one-tenth of the globe's population, are using nearly one-half the world's consumption of 7,663,000 tons of plant food fertilizer content. We use more phosphoric acid than the two other nations, but fall between Germany and France in the totals of nitrogen, phosphoric acid and potash. North Carolina uses twice as much as its nearest competitors (South Carolina, Georgia and Alabama) and these four tobacco and cotton states far surpass all the other agricultural states. Corn, wheat and fruit states trail in total consumption. The showing is better on a per-cultivated-acre basis for the populous states of the northeast. Florida, however, tops the list with a usage three times as great per acre as North Carolina.

In present capacity for nitrogen fixation the United States is second only to Germany. We have just under 10 per cent of the world's rating and Germany has 45 per cent of it. In production of basic slag and superphosphates this country accounts for more than a third of the 17,000,000 tons of world production. The manifest trend toward reduction of the worthless filler content of fertilizers holds out real promise for the farmer. The total U. S. fertilizer tonnage of 1928 was 3,300,000 tons less than would have been necessary had the average composition been that of 1914. Assuming $3 a ton for freight, it is evident that this amounts to a saving of nearly $10,000,000 in fertilizer transportation costs aside from other savings in storage, bagging, handling and spreading.

To get some idea of the international transactions, it is stated that in 1929 we imported 2,300,000 tons of fertilizer, worth $72,000,000, and during the same year exported 1,500,000 tons, worth $20,000,000. For the potash that goes into fertilizers we are largely dependent upon imports. During 1929 we imported 870,000 tons of potash salts, mostly from the water-soluble deposits of Germany and France. Our domestic production represented 16 per cent of our requirements in 1928. There are water-soluble deposits in Texas and New Mexico, unfortunately associated with gypsum. There is hope that the processing of these deposits, as well as those in New Jersey and Georgia, can be brought into competitive position with the European supplies.

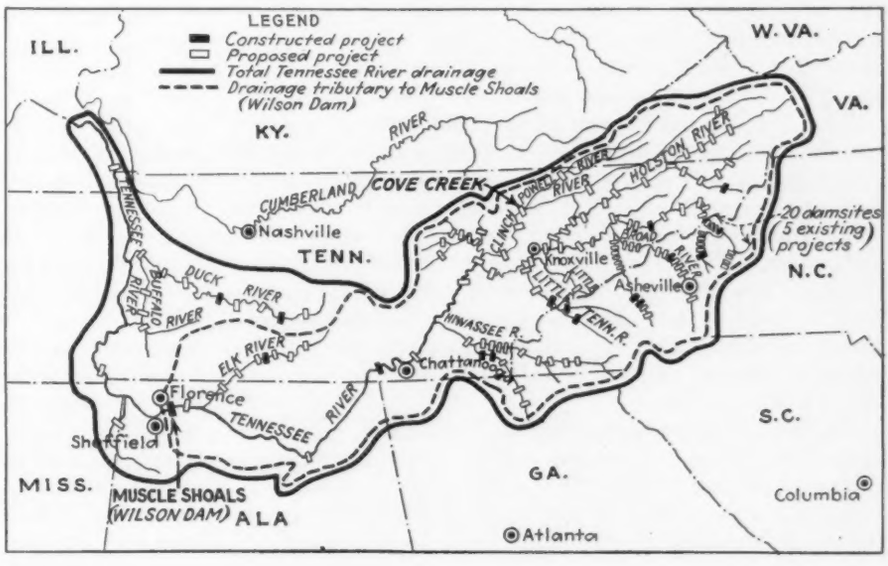
As for phosphate, we are well supplied with mineral deposits. Superphosphate production in 1928 amounted to nearly 5,000,000 tons. At the present rate of use our phosphate rock will last some 2,000 years. Idaho has most of the estimated 6,000,000,000 tons. The recent practice of adding anhydrous ammonia to the superphosphate materially enhances the chance that superphosphate will hold its leading position as a plant food in this country. Five per cent of ammonia would call for 225,000 tons to treat the 4,500,000 tons of superphosphate now being used, and would thus create a market for the nitrogen-fixation plant output. In 1929 we produced 60.5 per cent of our inorganic nitrogen consumption of 452,261 tons and exported 55,500 tons in addition. One hundred by-product coke plants produced 187,600 tons and air-fixation plants produced 84,000 tons to eke out the imports of 236,161 tons.

January, 1930, found us with 195,600 tons of annual capacity and 40,000 of this was in the Muscle Shoals cyanimide plant. The fertilizer industry takes 73 per cent of the present national production of nitrogen and the rest goes to chemicals, industrial explosives and refrigerants.

There is the fertilizer side of the picture. On it can be based any estimate of value of the government facilities to the fertilizer chemical industry.

Government operation for power would entail huge loss

Another side of the picture is the exploitation of the government-owned plant by the government for governmental competition with the private power enterprises of the district. This phase was the subject of a report to the



Muscle Shoals is one among many power possibilities in the Tennessee area

Estimated Value of Tennessee River Projects for Power for Public Utility Service

Under Existing Conditions and Assuming Use in Peak at 30 per Cent Load Factor at Low Flows

Project	Low Flow, Kilowatts	Primary Kw. Rating at 30 Per Cent Load Factor	Installation Kw.	Energy Available Average Million Kw.-Hr.	Estimated Investment Value Total	Per Kilowatt Installed
Coulter Shoals..	9,500	31,650	61,200	380	$8,258,000	$135.00
White Creek....	21,000	69,300	123,000	786	16,470,000	134.00
Chickamauga...	18,000	60,000	111,000	697	14,541,000	131.00
Guntersville....	16,600	55,000	105,000	652	10,164,000	(a) 97.00
Gen. Joe Wheeler Dam No. 3...	25,000	84,000	176,000	1,000	15,859,000	(a) 90.00
Pickwick Landing (b).....	29,000	97,000	198,000	1,178	22,729,000	115.00

(a) Alabama hydro tax, 4/10 mill per kilowatt-hour.
(b) Only in case a reregulating dam is built below Pickwick Landing.

commission by Lieutenant-Colonel M. C. Tyler of the army Engineer Corps. At the outset he says:

If the government should decide to embark in the public business with the 50,000-kw. prime capacity water power and the 60,000-kw. steam station at Muscle Shoals, it is assumed that its purpose would be to reduce the price of power generally in the adjacent territory by selling wholesale and at cost in direct competition with the existing public utility companies.

In such competition the government would have three great advantages, viz., lower interest rates on borrowed money, freedom from taxation on real property and on income, and no necessity for profit. These advantages should enable the government to sell power at low prices. However, the cost of power to the government would depend not only upon low interest rates and freedom from taxation but upon the extent and location of the market for power, the investment in generating and transmission facilities required to reach and supply the market and maintenance and operating costs. All these factors must be considered in determining, even approximately, the prices at which the government can sell its power without profit but without loss.

He then proceeds to analyze the economics of the sale of Muscle Shoals output within a 200-mile radius of the development. Although the utilities in this area disposed of nearly 2,000,000,000 kw.-hr. in 1930, it is not likely that the sales of Muscle Shoals and Cove Creek power would reach 1,000,000,000 before many years. The reason for this assumption of the army engineer is that neither plant is particularly well located to support an independent system, and such load as is taken on would be secured at the expense of the utilities. Also, much of it would be low load-factor draft by municipalities. Strong inducement of low wholesale rates would have to be made to induce the communities to raise and spend the money for local distribution systems. Only half of the communities are financially able to incur any large additional burden. Nor are the five large cities (Memphis, Nashville, Chattanooga, Birmingham and Atlanta) much better situated on the whole. Nevertheless, Colonel Tyler assumes that two of them could install municipal systems and increase their use of government power from 26,000,000 kw.-hr. in 1933 to 206,000,000 in 1946.

He further assumes that farmers would use the service to such an extent as to require 6,000 kw.-hr. per year for each mile of line and that 200 miles would be built each year. By such procedure the army engineer arrives at the total probable energy sales, revenue and required generating capacities. By 1946 it is estimated that the kilowatt-hour sales might have risen to 723,800,000 per year, bringing in a revenue of $7,325,000, an amount 20 per cent less than the recovery at prevailing utility rates. Wilson Dam capacity would meanwhile have grown to 236,000 kw. and Cove Creek to 165,000. Those figures represent

possible, not probable, sales provided the municipalities can and will raise and spend funds for distribution systems as assumed. Actual sales may be much less; they cannot be expected to be materially greater unless further large investments for additional transmission lines and substations over and above those herein estimated are made.

Federal operation nothing but socialistic subsidy

What would it cost the government by way of capital outlay and annual expenditure to provide this service? How much more would it cost the nation's taxpayers than would be saved local users through the 20 per cent lower wholesale rates that freedom from taxes and availability of low interest rates would permit the government to offer? Colonel Tyler estimates that this saving to consumers might aggregate $17,917,000 between 1932 and 1946, an average of $1,194,500 per year. Meanwhile, the federal government would accumulate a deficit of $39,674,000, at the average rate of $2,644,900 per year. Federal operation as a pure power proposition therefore entails an average annual loss to nation-wide taxpayers of $1,450,400 more than local citizens can benefit by it.

Colonel Tyler's conclusions are, therefore:

1. The government's power plants at Muscle Shoals and the proposed Cove Creek development are not suitably located to serve as the main generating stations of an extensive independent power system.
2. The construction of an independent system would involve large expenditures of public funds.
3. The cost of transmitting power in such a system would be high and the reliability of service at long distances from the generating center would be poor.
4. The construction of such an independent system would be an economic waste, in that it would duplicate transmission facilities now ample to serve the region.
5. It may be expected that the deficit from the construction and operation of such a system, which will have to be met by the federal treasury and the general taxpayers, will largely exceed any savings from lower rates which may accrue to the limited local public served.

Some contemplated developments of doubtful value

Having thus demonstrated the economic futility of sending more good money after money that has already gone bad while the whole project was being used as a rallying point for government ownership enthusiasts. Colonel Tyler proceeds to show the commission just how much further expenditure could be justified and what values leaseholds should have to prospective power and fertilizer bidders. His conclusions on these points are that the proposed power dams on the Tennessee (Coulter Shoals, White Creek and Chickamauga, estimated to cost $56,000,000) should be thoroughly investigated by public utility interests with a view to constructing them progressively, on an equitable division of cost with the federal government, to meet their demands for additional power supply. After the construction of the two projects below the mouth of the Clinch River (White Creek and Chickamauga) the increased power value which will be secured at those two dams and at Hale's Bar through the operation of the Cove Creek plant will be such as to warrant the construction of the Cove Creek project, probably

entirely at public utility expense. Other projects on the river are of doubtful economic value from the power standpoint.

With regard to Muscle Shoals, the report of the army engineer says:

> Due to the fact that there is no dam downstream from Wilson Dam which can reregulate the flow to meet the requirements of navigation, the primary power from Wilson Dam must be used in the base of the public-utility load if it is to be utilized in the public-utility system. It is estimated that in about five years the public utility could afford to pay annual rental for the existing power properties of about $1,600,000 per annum and assume all maintenance, operation, renewal and replacement costs and insurance.
>
> The lease of Wilson Dam to the public utility would delay the construction of other power-navigation projects on the Tennessee River by that agency in co-operation with the government until the Wilson Dam power could be absorbed.
>
> It is estimated that a chemical company or a group of companies in need of about 950,000,000 kw.-hr. per annum could not secure such an amount of energy from any alternative source, fuel or water, in the eastern United States for less than the cost of maintenance, operation, renewal and replacement costs, and insurance of the Muscle Shoals power plants plus a rental charge of 2.2 mills per kilowatt-hour up to 950,000,000 kw.-hr. per annum. If the lessee would agree to utilize 950,000,000 kw.-hr. within a reasonable period, say five or six years, at 2.2 mills per kilowatt-hour, the rental value would be about $2,000,000 per annum.
>
> If and when a navigation or power dam is built in the vicinity of Colbert Shoals (about 30 miles below Wilson Dam), it will then be possible to operate Wilson Dam on peak load. The rental value to the public utility of Wilson Dam and the steam plant over and above maintenance, operation, renewal and replacement costs and insurance would become approximately $3,000,000. To a chemical company they would have a value of about $2,600,000, provided it be permitted to exchange peak capacity and energy with the public utility for offpeak power.
>
> The Cove Creek storage would increase the value of Wilson Dam to the public utility by about $800,000 per annum, but to a chemical company probably less than $300,000 per annum.
>
> The installation of additional units in the Wilson Dam power plant appears uneconomical under existing conditions. The cost of producing secondary water power with new units will probably exceed the savings in steam-plant costs secured by using such water power in substitution of energy which otherwise would be produced from fuel.

Colonel Tyler includes in his report the assumptions and premises upon which he arrives at the respective and prospective costs and values of the various steam and hydro developments: "A hydro plant has a value which will allow power to be produced at a cost equal to that which may reasonably be expected as the cost of obtaining an equivalent amount of energy from a modern steam plant." He attaches greater dependability to hydro in general and assigns steam an 80 per cent utilization factor, with correspondingly higher reserves required. For every dependable kilowatt of hydro it is assumed that at least 1.15 kw. of steam would be required to achieve the same results. Some $70 a kilowatt is assumed for steam plants operating at 400 to 450 lb. with an economy of 13,500 B.t.u. per kilowatt-hour. Coal is estimated at $1.60 per ton for plants near the mines. Fixed charges are taken at 8.5 per cent for hydro plants and 10.5 for steam plants, both including 1.5 per cent for taxes. The federal government is relied upon to contribute the amounts properly allocatable to navigation in connection with the hydro developments.

Cove Creek should be developed by private interests

Costs and conditions have changed substantially since the 1928 Engineer Corps estimates upon which House Document 328 were based. Taking into account these changes, the above assumptions, and the fact that H.D. 328 contemplates much too much in magnitude of proposed additional installations, Colonel Tyler computes a value for public utility use of each of the seven projects on the river.

The Cove Creek project in northeastern Tennessee possesses three elements of value, power, flood control and regulated river flow, with consequent enhancement of downstream power potentialities. It is estimated that a 165,000-kw. installation there would cost $34,143,000, but its value for power purposes would be only $17,108,000. However, its existence would add to power sales possibilities at White Creek, Chickamauga and Hale's Bar enough to offset this deficit. This means that private utility interests could afford to build Cove Creek at their own expense as soon as power from Coulter Shoals, White Creek and Chickamauga has been absorbed. After these three and Cove Creek are in operation Dam 3 and Pickwick Landing would also show a margin of power value above cost.

As now equipped, Muscle Shoals, on an equivalent steam cost basis of $1,672,000 for its 438,000,000 primary kilowatt-hours at 1.4 mills and a sale value of 1 mill for its 600,000,000-kw.-hr. of secondary power, would be worth only $1,347,000 of annual rental value to a utility after about five years of progressive operation. The Sheffield steam plant, likewise, would be able to command an annual rental of only $248,000, making

Estimated Cost of Tennessee River Projects and Surplus or Deficit on Basis of Federal Contribution as Offered in River and Harbor Project, with Estimated Cost of Second Lock Retained for Future Construction by the United States

Project	Original Lock	Dam	Reservoir	Power House Forebay and Substructure	Power House Superstructure and Equipment	Total	Federal Contribution Less Second Lock	Interest on Federal Contribution During Construction	Power Investment Value	Surplus	Deficit
	000 omitted										
Coulter Shoals	$3,148	$3,208	$1,878	$1,325	$3,465	$13,024	$6,922	$623	$8,258,000	$2,779,000	.....
White Creek	2,579	5,136	3,115	3,123	7,423	21,196	11,971	1,077	16,470,000	8,322,000	.....
Chickamaugua	2,895	4,856	4,821	3,181	6,023	21,776	8,095	728	14,541,000	1,588,000	.....
Guntersville	2,022	4,778	5,333	3,401	6,171	21,705	5,055	455	10,164,000	.....	$6,131,000
Gen. Joe Wheeler Dam No. 3	1,600	11,775	5,776	3,779	8,852	31,782	6,839	615	15,859,000	.....	8,469,000
Pickwick Landing (a)	4,467	10,975	3,391	5,130	10,202	33,165	2,700	243	(a) 22,729,000	.....	7,493,000

(a) Only in case a reregulating dam is built below Pickwick Landing.

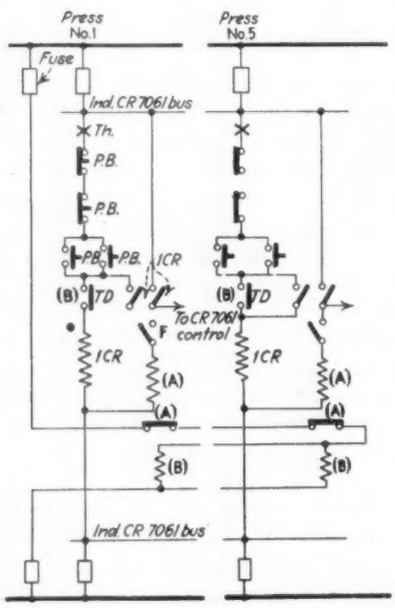
$1,595,000 for the two existing plants. A chemical company, however, could use power at better load factor and, if it could concentrate its operation into eight months of the year, might afford to pay $2,169,000 of annual rental. It could also probably sell 50,000,000 kw.-hr. of secondary energy and derive a credit revenue of $50,000 against its rental. A company that preferred to equalize its annual operations would have to operate the steam plant and the combined rental value would be reduced to $1,808,000 because of the poor efficiency and high coal cost at Sheffield.

▼

Outage of Presses Prevented by Sequence Starting

By L. F. STONE

General Electric Company, New York, N. Y.



Control connections for sequence starting

In newspaper production all presses are usually loaded and ready except for the last-minute front-page form. When this form arrives from the stereotype room all presses race to get started, frequently tripping the feeder breakers and causing costly delay. This is avoided in the new Brooklyn plant of the New York *Times*, which has five presses and ultimately eight, by sequence starting of the presses to keep down the peak loads. It was accomplished by the use of relays and contactors connected as shown in the accompanying diagram.

The time-delay circuit closing contact of relay (*B*) is in series with the master control relay (*1CR*) of each control equipment. The coils of all the (*B*) relays are in parallel, and are fed through the series of normally closed contacts on the (*A*) relays, one for each equipment. Each (*A*) relay coil is connected so as to be energized during the starting period; that is, from the closing of the *1CR* relay to the closing of the field contactor on the panel.

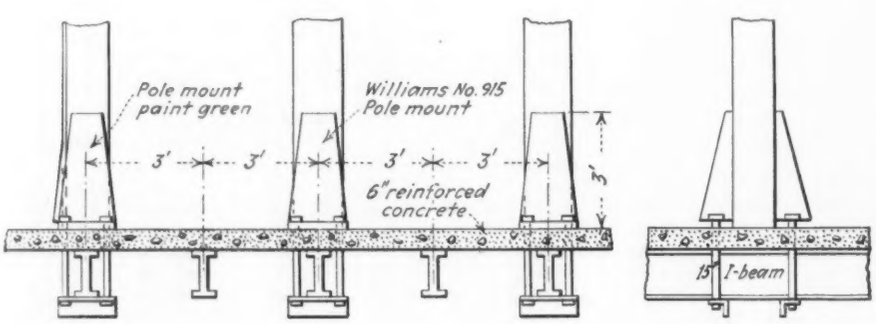
With this equipment, the first press to start picks up its individual (*A*) relay, holding the (*B*) relays on all other equipments open until the press comes up to speed. After the field contactor closes its (*A*) relay is de-energized and drops to make contact again. All (*B*) relays are energized, and due to different time settings the next machine to start is determined by giving its (*B*) relay the minimum time setting. If this machine is not ready, with the operator at the control button, the next (*B*) relay to time out takes control, etc.

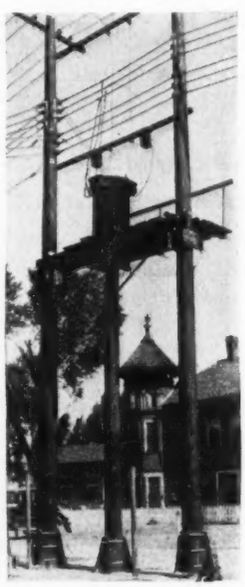
The time settings were graded to conform to the sequence in which the forms are delivered to the presses, and the saving in lost time and high demand charges has already paid for the extra equipment required.

▼

No Holes for These Poles

An unusual task of placing a distribution pole line on concrete paving with the poles mounted on the surface was accomplished recently with the use of special pole mounts on the system of the Citizens Power & Light Company at Council Bluffs, Iowa, according to C. A. N. Armstrong, distribution engineer Nebraska Power Company. The pole line is located in an alley 20 ft. wide, 18 ft. under which is an old creek bed. The paving over this creek is 6-in. reinforced concrete and is supported by 15-in. "I" beams spaced 3 ft. center to center. It was necessary to locate five poles on this paving, two for secondary distribution, and a three-pole platform, large enough for two 75-kva., single-phase transformers paralleled for single-phase service. Each pole was placed over an "I" beam and braced with Williams pole mounts. The mounts are clamped to the "I" beam with $1\frac{3}{8}$x27-in. galvanized machine bolts and a 5x5x16-in. $\frac{1}{2}$-in. galvanized angle iron. The poles are 5 ft. shorter than would ordinarily be required, since they are flush with the surface. The line is quite neat looking and apparently as strong as an ordinary line with poles which have been set 6 ft. deep in earth.





Broadcast a Creed of Economic Resolution

By BENJAMIN A. JAVITS
Of the New York Bar

UTILITIES can contribute tangibly to a long-range program of economic stabilization and security. But any plan or program for American prosperity or for the contribution by any industry to American prosperity must start with premises or assumptions. This is true in discussing any problem. Particularly in discussing the utility industry must we lay the foundation of premises and assumptions, since it is the industry, figuratively, which is the apotheosis of all that is implied in the words the "machine age." The premises and assumptions are as follows:

1. Wealth can actually be "created" in sufficient amounts to meet world need without resorting to what is known as "speculation."
2. The mobilization of credit and its intelligent creation and use are essential in this process.
3. The public utility industry, like every industry, must show substantial profits after setting up all reserves in order to be able to make its full contribution toward the development of credit.
4. The public utility industry, like all other industries in this modern age, must set up substantial reserves against obsolescence.
5. The machine is the ultimate beast of burden.
6. The benefits of every elimination of waste, or reduction of cost, or improvement of product should be shared fairly with all those interested in the production process.
7. The market in the United States is not more than 25 per cent developed, even for public utility services.
8. Every man is entitled to a fair return for the services which he renders, and to security of opportunity to render those services.

The theory of competition, the theory of economic independence, the theory of rugged individualism, and a great many more of the notions of 1890, still persist in our 1932 ideology. But the march of economic processes teaches us things which we ourselves are not alert enough to learn academically. Practical situations make people think. Periods known as crises, such as every country and every people experience, make us face changed conditions and make us formulate a new approach to the new conditions. The United States is undoubtedly going through one of these crises in human affairs. In fact, the whole world is in one of these periods. The crisis, however, is purely an economic one. It is no longer a battle between kings. It is not a battle between employer and employee, each denying the other's rights. It is no longer a battle to realize an abstract political concept such as liberty. But it is a battle of all the people, how so to order the economic processes that economic security and freedom may be assured to all. The millionaires of Germany, England, Italy and the United States are just as much in the balance as is the average man employed in a factory with respect to his economic future.

Backward countries, disorganized economically, like Russia and Italy, have found it necessary to have dictators. Other nations, like England and the United States, which are more organized in the economic sense, have suffered, but have been able to pull through to this point without dictators. Yet on every hand, and in every one of these latter nations, there has been a cry for some leader to lead the economic forces and the nation out of its difficulty. In the United States we have not found such a man, and if he were found it is very questionable whether he could or should have or be entitled to exercise powers such as are in the hands of a Mussolini or a Stalin.

But we are fortunate in this country in having one industry that is fairly well organized, that is as yet fairly prosperous, that is for the most part working along sound, modern economic lines, from the point of view of perceiving what is its obligation. I refer to the public utility industry. The public utility industry is organized more along the lines of rendering service than any other industry in the country. The industry has been more ready as an industry to accept the principle that any savings which are effected in the production of the commodity should be shared with its customers. But the public utility industry, if there is a general economic collapse such as we have been threatened with more and more in the last year or so, may find itself in the same disorganized state as practically every other industry in the country. The spirit of this country would welcome an industry rather than a man to show the way out of our economic wilderness.

Because of its modern point of view, because of its intelligent aggressiveness and its reasonably sound condition, because of its motivating principle being service, because of its vital necessity to the life of our people, and because of a number of other like reasons, the public utility industry can, if it will, turn the tide toward a greater and better economic order than any of us has visualized.

The public utility industry can do it, not by working toward the same kind of prosperity we have had before, but by working through an ordered plan, toward a secure prosperity.

For a number of years, and long before the present

We, the Citizens of the United States, Believe:

That our constitutional rights to "life, liberty and the pursuit of happiness," although the heritage of every true American, are impossible of accomplishment for rich or poor in this country until economic strife and insecurity are done away with.

That since this nation was the first to demonstrate that it is possible for the machine eventually to take over the toil of man, America is no longer solely dedicated to the building of a political democracy, but it is also dedicated to the realization of an industrial democracy.

That although industrially we are still a long way from relieving all men of toil, we are determined that the machine should ultimately accomplish this, and we dedicate ourselves to the proposition that the benefits derived from all of us working together to improve our production, distribution and exchange processes should be equitably distributed among all our people.

That since the profits of the labor of all of those who have gone before are the wealth and capital of today, and since this wealth is not sufficient (even if equally divided) to maintain the whole population of our nation in such a standard of living as we believe the least of us is entitled to, and since the whole population prospers only as industry profits, we support the principle that the services and the capital of each American are entitled to fair compensation, and that such principle is a fundamental one and must be secured.

That since we believe that every American is entitled to an optimum of the best of food, clothing, shelter, education, leisure and cultural arts, we believe that the production capacity of the nation is not too great, but that we must dedicate ourselves to finding ways and means of increasing the purchasing power and assuring its steady continuance.

That the goal and purpose of American industry and the machine age is to eliminate unemployment and provide economic security, and that this goal can easily be accomplished in 25 years if the following objective is set in terms of the 1929 value of the American dollar:

$350,000,000,000 in national income in 1956, as against $90,000,000,000 in 1929.

$1,600,000,000,000 in national wealth in 1956, as against $400,000,000,000 in 1929.

In 1956

A six-hour day—A five-day week—A 48-week year.

We pledge our faith to the accomplishment of this goal.

This goal can be reached in 1942 if we put our brains, our hands and our old-time vim to work right now

depression, I have been interested in seeing industry organize to avoid depressions and to lay out sound policies and plans for obtaining a continued assurance of a prosperous state, but I have not found it practicable to get industry organized simply to accomplish what might be termed a "state of good business." Something much more practical, something that would put spirit and fire behind the whole idea of business men getting together, has to be formulated. In my work as counsel for the Association for the Co-ordination of Law and Industry during 1930 and 1931 we developed, I believe, the method of approach to the solution of the problem of how to get the organization of American industry under way so as to make prosperity sure—the visualization of a definite goal for industry.

Let me relate my recent conversation with some of those who are close to the so-called "Progressive" Senators in Washington, where I was called to testify before the La Follette committee. My first question was, "What is electric power actually worth to the people?"

It was finally agreed that if there had to be a choice between electric power and no electric power it was worth $1 per kilowatt-hour.

Second, as to the proposition that public utilities were monopolies, it was finally agreed that public utilities were not monopolies; that coal, oil and natural gas competed with electricity and the old line gas companies; that the electrical industry is not immune from competition. It was my view that if the public utility interests were in any way unreasonable in their charges, or unfair in their service, such an action would give the greatest impetus to creating methods and means of competition, and would deprive them of their franchises. It was finally agreed that the electrical industry was not setting up out of its income sufficient reserves to protect the investors in the industry in the event that some new means of power or transmission should suddenly be developed, such as the fulfillment of Marconi's prediction that power will some day be sent through the air.

With respect to the question of "excessive rates," those with the Norris point of view said that the public utilities were unreasonable and excessive in their rates and in their charges. It was finally admitted that in practically every contract and every franchise there was provision for adjusting the rates; that those who found fault could always get their day in court, and that even in the cases where the public utilities were prosperous their prosperity was a great and lasting benefit. As pointed out, the utilities have to be most reasonable or lose their franchises.

On the other hand, suppose business got so bad that the utilities gave up their franchises. The first thing the politicians would do would be to raise the rates. Nobody, not even the state or the government, wants anything unless it is going to show a profit.

It should also be remembered that those who let a franchise to a public utility nearly always have an opportunity to give it to those who can make a better offer. The situation is similar to the contract for marriage. When a poor and obscure person enters into the bonds of matrimony and then comes into power it is fair that he should share his fortune with the one who has taken him for better or for worse. It is not the decent and fair thing for him to do to throw over his partner. Similarly, it is indecent and unfair for any municipality or city which has made a contract with a public utility constantly to harass it and make political fortune out of the relationship. When the company is making some profit and getting a decent return it is fair that the contract be lived up to. That is the American spirit of fair play. No company continues its franchise unless the courts consider that franchise legal. Do the Norrises and the La Follettes wish to consign our constitutional principles and rights to the scrap heap?

For what purpose? Their idea of profits is clearly out of line with modern needs and requirements.

Profits are not harmful

Now with respect to the matter of profits. Most of the fallacies in the many suggestions that have been made for changing the status of public utilities come from a misunderstanding on the part of the so-called "radicals" and "progressives" as to what profits are. They do not seem to know that the profits which industry produces are that which is left over from day to day to become the wealth of tomorrow. They do not seem to know that this wealth is shared in to a greater or less degree by all the people.

The point may be illustrated in this way: Assuming that a utility produces a profit of $10,000,000 a year, practically all of that money either goes into the utility itself for improving plant and structure, etc., or finds its way (through being spent by the stockholders receiving the dividends) into new industries or old industries, and thus makes its full contribution to the social well-being. Even if it merely goes into banks, it is loaned out on mortgages and invested in the same industrial processes of which each one of us is a part. The country is not suffering from a surplus of profits, but because of a lack of profits.

I testified before the La Follette committee that it was my belief all of the American people would enthusiastically back an economic plan and program which had the promise of a prosperous condition in which all would participate. The American people are not interested in the demagogic utterances of politicians who are making capital out of false economic doctrines. But because industry itself does not defend itself on the basis of the new economics—that is, among other things, of the soundness and fairness and general helpfulness of profits in industry—the American people themselves have no economic leadership, and, although not strongly favoring the views of Norris and La Follette, have no other standard to which they can rally.

According to the figures we analyzed in the Association for the Co-ordination of Law and Industry taken from the various studies of growth of wealth and income in the United States, we arrived at the figure of about $3,000 per person in wealth for 1929, which would show the country much too poor to be able to work out any plan of actual "stabilization" to make employment secure or to assure a decent standard of living, especially when it is remembered that 15 per cent of our people control about 80 per cent of the wealth. In other words, 85 per cent of our people have an average wealth per capita of not more than $500, which is certainly nothing to work with in trying to build an ordered society that is capable of doing the things we hope for from our American system.

Profits for all a desirable element

The point is often made that it is grossly unfair for a comparatively few people to own the wealth of the nation. The answer to that, however, is this: Is it not better that we now leave unmolested those who have wealth, and who by having it raise the general level of wellbeing and security, rather than take it from them and so divide it that it would mean little or nothing for anybody?

If it were put up to the mass of the people whether they would favor substantial profits for all people and all industries as well as themselves, would they do so, or would they favor bringing all industries and all people into a state of penury? Any one with the slightest understanding of our American philosophy would answer this question in but one way.

A plan of industrial organization in which the public utilities would take the lead and which would increase the wealth of all of the people would proportionately decrease the burden that wealth now is to the comparatively few who have it and are owned by it.

The public utilities, as a practical matter, lay a psychological basis for the new society in which we now live, a society based upon business dedicating itself to making profits and getting security for all of the people, and all of the people in turn working with industry everywhere to get this job accomplished. If all the public utility companies would take a statement like the one I append and get it distributed to all their customers and then begin to educate all the people as to all the possibilities for a bigger and better life implied in the statement, we would get a better condition in the country, one in which people all over the country would be glad to see the public utilities prosper, one in which the utilities might not be accused of doing a number of things that are unpleasant and unbusinesslike.

If the public utility industry would commit itself to a general program and plan for increasing the wealth of our whole nation, the attitude of our whole people might be changed not only toward the public utilities but also toward every other organization of business men.

It would do much to put the politicians in their places. It would change the whole psychology of the American people to one of hope and inspiration and application to the task set before them. It would open the field for developing the public utility industry to a greater extent than has ever been attempted.

The creed should be put into every home, factory, store, office and public building.

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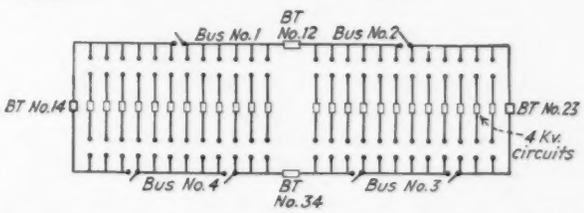
Staggered Bus Sections



Bus sectionalizing on a new idea is illustrated in this drawing, which shows the scheme employed in the recently completed Wendell Street substation of the Commonwealth Edison Company, Chicago. There are four 4-kv. buses with normally open bus tie switches between them. The buses are paired and circuits may feed from either one of a pair.

Because of the proximity of the buses and the fact that a maximum outage of three circuits could be tolerated when repairs were being made on buses the idea of staggering the bus sectionalizing disconnecting switches was conceived. Obviously the same results could be obtained with paired sectionalizing disconnective switches between each section of three circuits, but this would necessitate twice as many switches.

Simplified Frequency Changer

By A. W. FORBES
President Forbes & Myers, Worcester, Mass.

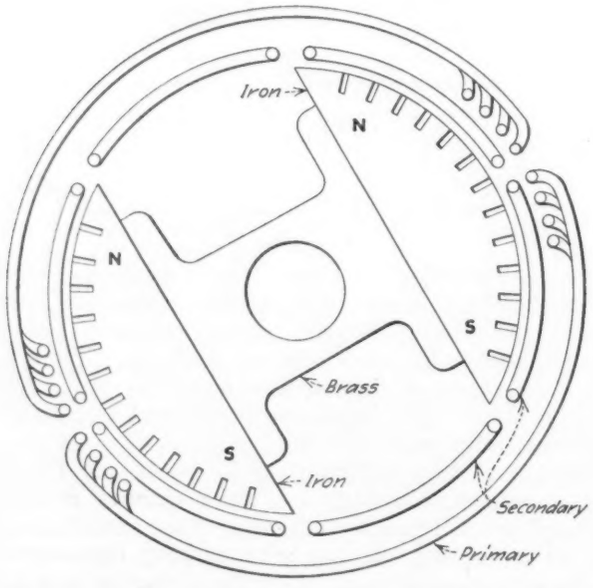
Unit consists of modified squirrel-cage induction motor.

Multi-winding provides for multiple-frequency delivery.

Grinding and woodworking machinery, portable tools, etc., furnish applications.

WHILE the slip-ring type of induction motor has long been used as a frequency changer when the rotor is separately driven, a more recent development embodies the use of a modified squirrel-cage induction motor in which the brushes and driving motor are eliminated. In such applications two windings are placed on the stator in the same slots, one for the frequency of the supply circuit and the other for the desired different frequency for utilization. The rotor differs from that of the ordinary induction motor in the shape of the core only.

The basic principle of design is shown below. Only one phase of each winding is shown, but both windings (the two-pole primary for 60 cycles and the six-pole secondary for 180 cycles) are usually polyphase windings identical with the windings of ordinary induction motors. In this design the rotor consists of two pieces of iron supported on the shaft by brass or other non-magnetic material. The two iron pieces are made of the right length to span two poles of the six-pole winding. When the magnetization by the primary phase shown is at a maximum the rotor will take the positions shown, and it is magnetized by the two-pole primary as indicated at *N* and *S*. If the rotor is made to turn at exactly synchronous speed of the two-pole winding, each phase in turn will keep the rotor properly magnetized, with the result that the six-pole winding delivers 180 cycles.



Frequency changer design for 1 to 3 ratio, using two-pole primary and six-pole secondary in stator, 60 to 180 cycles

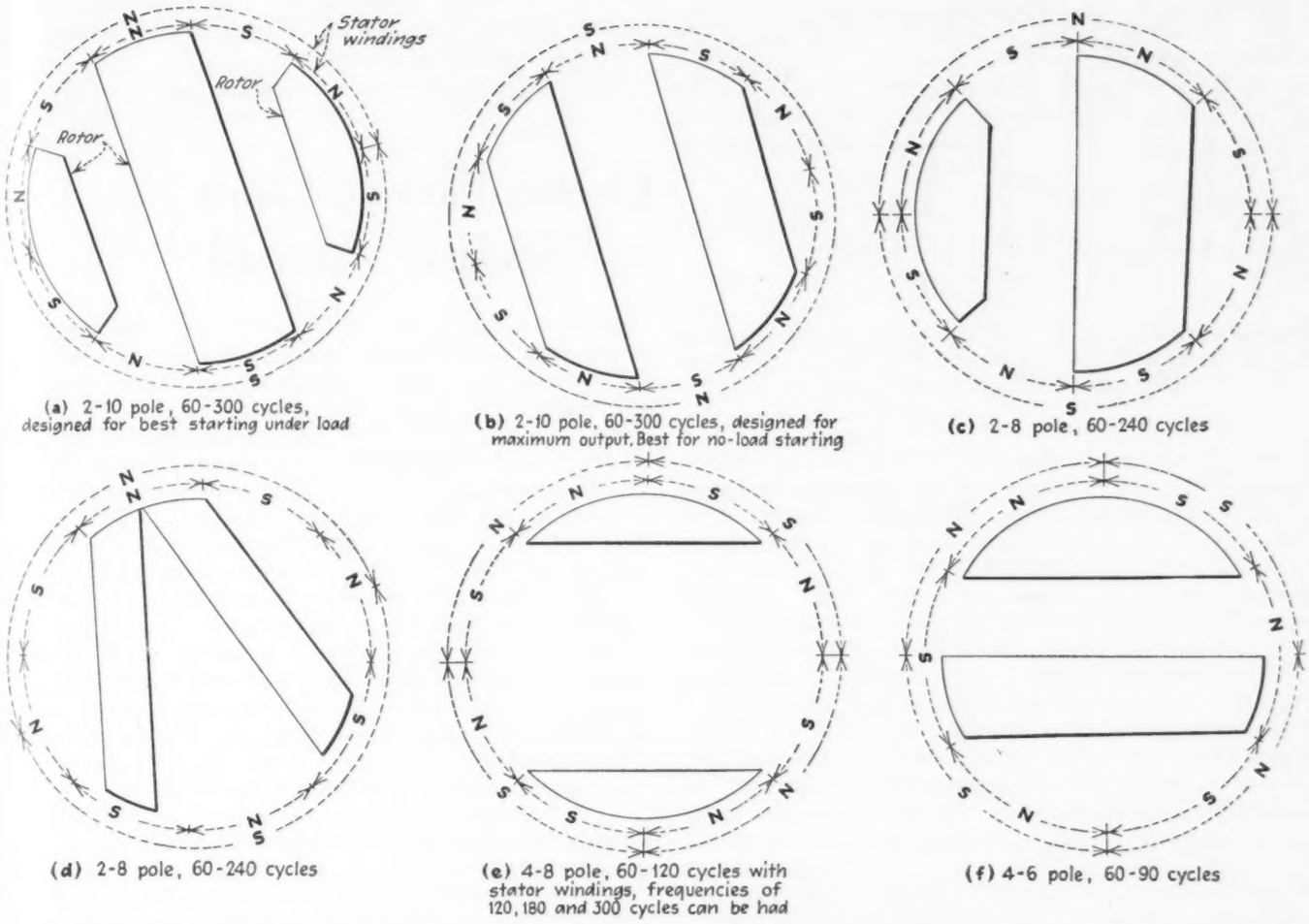
Once the rotor is at synchronous speed the revolving field produced by the primary or 60-cycle winding will keep it in step. In practice the rotor maintains synchronism on heavy overloads and in most designs will not fall out of step even under short-circuit conditions. A low-resistance squirrel-cage winding is used to bring the rotor up to synchronism. This resistance can be as low as desired, since the rotor turns freely without any starting load. The weakest point is on pulling into synchronism and the final bringing into step is by magnetic attraction alone. In practice it is found that some designs of frequency changers will pull into synchronism with 50 per cent load on the secondary winding and in others with but 20 or 30 per cent. In all cases it is recommended that the frequency changer be started first, applying the load to the secondary after the rotor is up to speed.

Methods of obtaining other frequencies

A wide range of frequency transformations can be secured by proper designing of rotor pole and stator winding relationships and considering whether starting under most favorable conditions or delivery of maximum output is the controlling element. The 1 to 3 transformation ratio is the simplest and cheapest to build. A 1 to 2 ratio, with two and four poles, seems simpler, but it is impossible to build such a unit with the iron even approximately balanced. Badly unbalanced magnetic pull results in noise and vibration. For the 1 to 2 ratio it is necessary to build with four and eight poles. Ratios of 1 to 3, 1 to 5 and 1 to 7 are all cheaper than 1 to 2. Even ratios of transformation are more difficult than the odd ratios, since the latter permit a symmetrical design of the rotor iron.

Intermediate ratios like 2 to 3, 3 to 4, 2 to 5, etc., require more complex structures in theory if not in mechanical arrangement. Unbalancing has to be compensated for even in small sizes, and this is done by either modifying the theoretical shape or by increasing the air gap. Both courses reduce the efficiency of transformation, but in many applications this is not a serious objection.

In certain cases it is possible to design a single unit to


Stator windings
Rotor
Rotor
(a) 2-10 pole, 60-300 cycles, designed for best starting under load
(b) 2-10 pole, 60-300 cycles, designed for maximum output. Best for no-load starting
(c) 2-8 pole, 60-240 cycles
(d) 2-8 pole, 60-240 cycles
(e) 4-8 pole, 60-120 cycles with stator windings, frequencies of 120, 180 and 300 cycles can be had
(f) 4-6 pole, 60-90 cycles

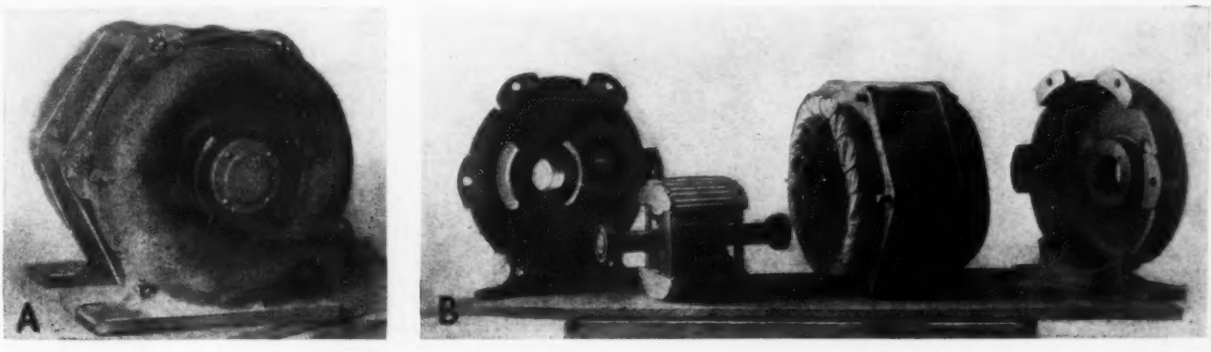
Arrangement of poles for one phase of primary and secondary windings for various frequency transformations

Arrow heads indicate extent of poles of one phase for each winding.

deliver several frequencies. With modifications of the iron structure, as by making pieces a little large for one service and a little small for another, and by the use of several windings on the stator, various frequencies can be obtained. Thus, in one case, by modifying the iron structure of the rotor and putting five windings on the stator, we obtain 120, 180 and 300 cycles from a single frequency changer. A two-speed motor, two- and four-pole, when operated by such a frequency changer, will give speeds of 1,800, 3,600, 5,400, 7,200, 9,000, 10,800 and 18,000 revolutions per minute. Other combinations can be had, each being a separate design.

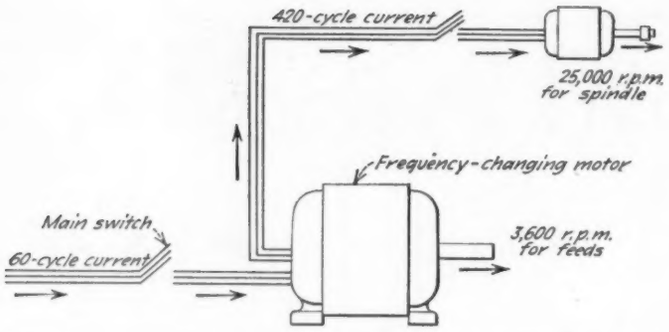
Up to this point each piece of rotor iron has been considered as a solid piece. It is undesirable to laminate the rotors, as in ordinary induction motors, but there are certain subdivisions which improve performance. In general, the iron should be so divided and the parts so separated as to produce the greatest possible magnetic reluctance when the rotor is turned to any position except that in which it is intended to be. However, the flux must be free to move across the squirrel-cage bars when starting. Simplicity of construction must also be sought and there is room for study in the disposition of material.

A further development of the frequency changer which



Completed frequency changer, rating 1 kva., 60 to 180 cycles

(a) Assembled unit. (b) Dismantled view of stator, rotor and end shields.



Internal grinder drive with frequency-changer motor driving feeds at 3,600 r.p.m. and high-frequency motor driving spindle at 25,000 r.p.m.

is specially applicable to internal grinders, woodworking machines, etc., utilizes the frequency changer as a source of excess mechanical power for special driving. The frequency changer shaft can be directly connected to the feed of a machine, for example, while the high-frequency current operates the spindle or cutting head. In such service the unit is really a frequency changing motor. It is an induction motor, as simple mechanically as the ordinary induction motor, but supplying the high-frequency current without further complications.

The advantages of the unified design described are chiefly in the line of simplicity, freedom from care and absence of required skilled attendance. The field of usefulness runs up to about 10 kva.; from 10 to 50 kva. is competitive ground with the synchronous motor-generator set, and above 50 kva. it is not expected that the simplified design featured in this article will find application. As for the slipring induction motor type of changer, which is intermediate between the multiple winding unit and the synchronous set in simplicity, performance and price, its power-factor and voltage regulation are inferior to the synchronous outfit, and this is the only type that does not maintain its frequency exactly. In the author's opinion, this will ultimately be superseded by the two other types.

The multiple winding unit can be sold at a low price in small sizes, often less than half that of the synchronous set. Lack of injury under short-circuit is a valuable point, and under such conditions it drops its voltage and remains running without overload. The power factor is low as compared with the synchronous set, but there are many applications where this is not vital. Despite the fact that an alternator will give closer voltage regulation, the unit will serve the requirements of ordinary motor applications. The larger sizes also require more active material, but this is unimportant in numerous smaller applications.

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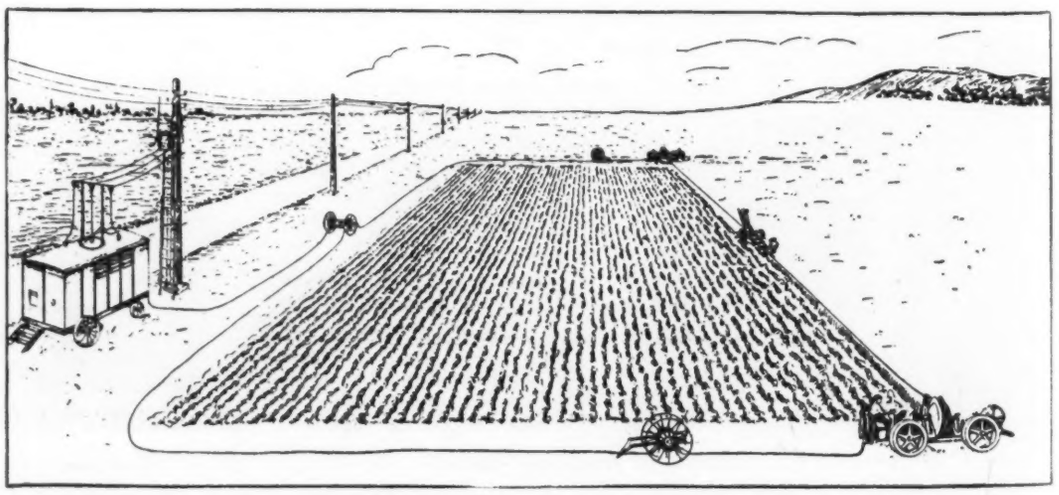
Electric Plowing Gains in Popularity Abroad

There are more than 200 electric plow installations successfully operating in Europe, according to a recent statement by R. Borlase Matthews in *Distribution of Electricity (England)*. In France several electrical enterprises are reported to have added special departments through which electric plows may be obtained on a purchase or rental basis. At 2 cents a kilowatt-hour the cost of electrical energy for plowing is 60 cents an acre on the average. Contract plowing in the old way ranges, according to Mr. Matthews, from $3.50 to $6 an acre. Thus a wide margin is available to allow for interest on the investment, depreciation, labor, etc.

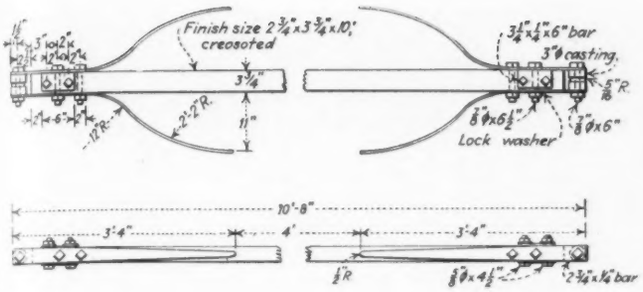
The cost of the machine, including plow, ropes, cables, high-tension connections and transformer wagon, ranges from $15,000 to $20,000, or only a little more than the cost of steam plow equipment of equal capacity. Up to 30 acres a day can be plowed with one unit. The motors used range from 50 to 150 hp.

Actual plowing equipment consists of an anti-balance plow and two haulage units, on each of which is mounted a steel rope drum driven by an electric motor; the steel rope unwinds from one drum as it is wound on the other. The plow speed averages better than 3 miles an hour. The hauling carriages are advanced, as each furrow is run, by a clutch which permits the motor to drive the traction equipment. Cable reels arranged for paying out the conductors without abrasive dragging supply the energy to the haulage units.

According to Mr. Matthews a well-managed installation would be in service 200 days a year, offering an attractive load at a good load factor. Presumably this infers a planned community utilization of equipment rather than individualistic and independent use with consequent lengthy periods of idleness, but that is of course a factor in any large-scale plowing plan.



A typical electric-plowing layout



High-Strength Wood Guy Insulator Utilized

By H. V. INGERSOLL

Stone & Webster Engineering Corporation, Boston

Wood strain insulators were used in guying the 110-kv. Petersburg-Roanoke Rapids line of the Virginia Electric & Power Company in connection with H-frame construction. The importance of reliable guys necessitated the design of an insulator which would at a reasonable cost assure a maintained strength greater than that of the guy wire over a period of years. Several designs were experimented with in the field, tested in the laboratories and improved from time to time to the present design, which is shown in the accompanying illustration.

In order to provide wood with high uniform strength it was decided to use Douglas fir, creosoted to safeguard it against possible decay and meeting the following specification: "Timber shall be clear, straight grained, sound Douglas fir having an average of not less than eight rings per inch. It shall be free from knots, shakes, pitch pockets, cross or spiral grain or any defects that shall impair the strength of the timber."

Previous experience with wood insulators indicated that unless the wood were protected by arcing horns, lightning strokes would cause severe shattering. Accordingly exhaustive laboratory tests were conducted up to 2,000,000 volts in order to determine the correct spacing and spread of the horns which would assure protection to the wood without sacrificing any of its insulation. The mechanical details were developed after tests had been conducted on various designs in a testing laboratory. The present design indicates that it will withstand a force of well over 20,000 lb. without failure or appreciable "creepage." The strength of the guy wire used is 15,000 lb., which indicates that a reasonable factor of safety may be expected. The impulse flashover strength of the insulator is approximately 700,000 volts.

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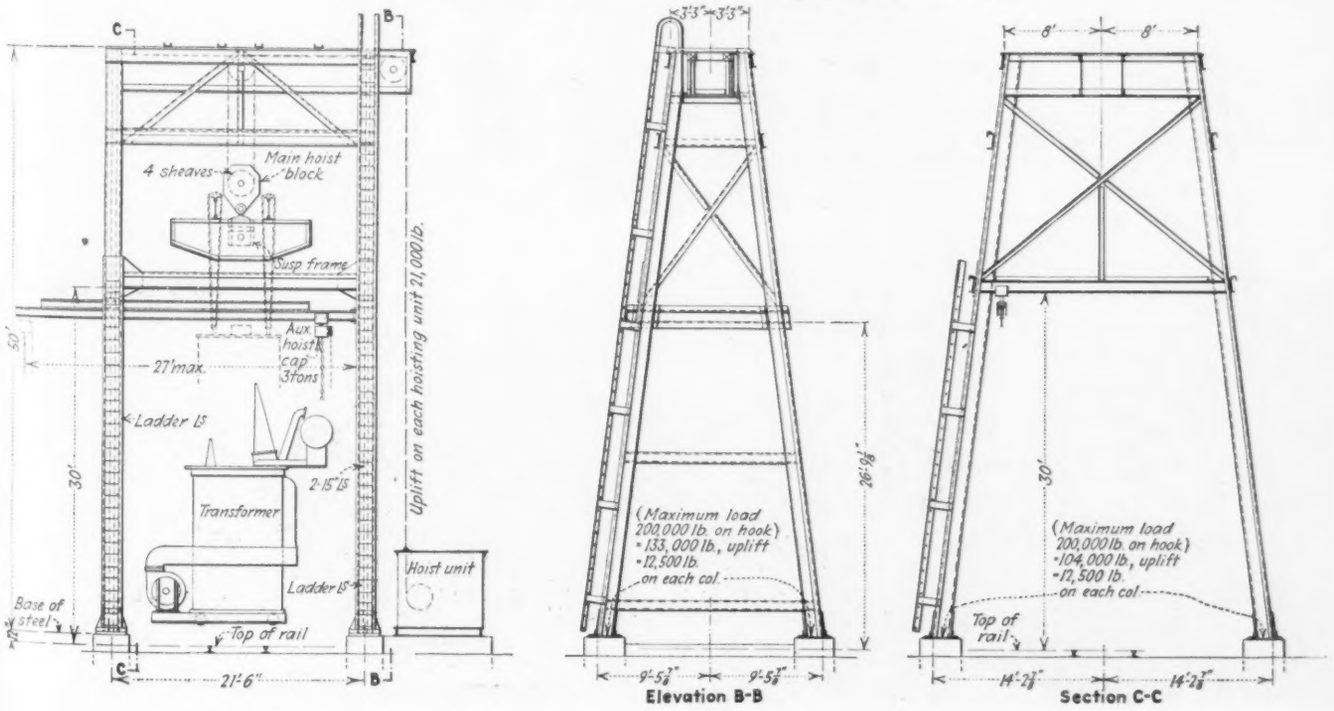
Transformer Lift Simplifies Maintenance

This specially designed hoist has greatly simplified the maintenance of transformers and similar equipment in the Benton Harbor (Mich.) Riverside substation of the Indiana & Michigan Electric Company. Installed at a strategic point in the station yard, equipped with a hoist of 60 to 100 tons capacity and provided with a 3-ton swinging arm hoist for bushings, etc., any necessary material handling may be done without the temporary erection of special structures.

Construction costs have been minimized in designing and erecting this frame. The use of steel cable instead of chains and the introduction of double motor drive brought further construction and operating advantages as compared with familiar designs. Frames of this kind are widely used upon the properties of the American Gas & Electric Company.

Steel frame with motor-driven hoists for equipment handling



New Conceptions of Switchgear

By R. PAXTON

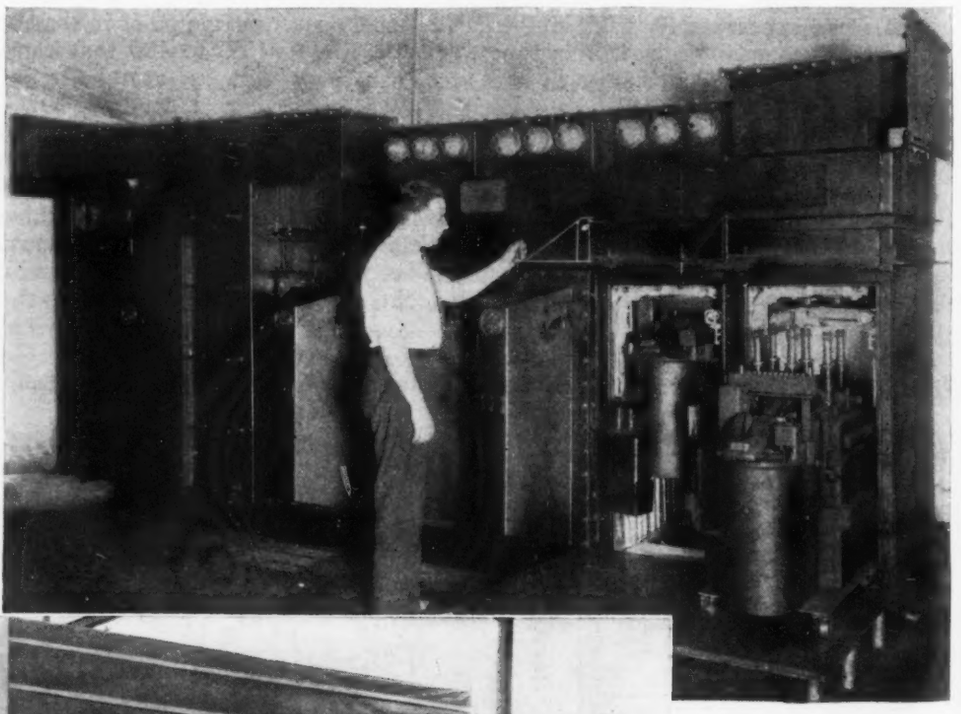
Switchgear Department, General Electric Company

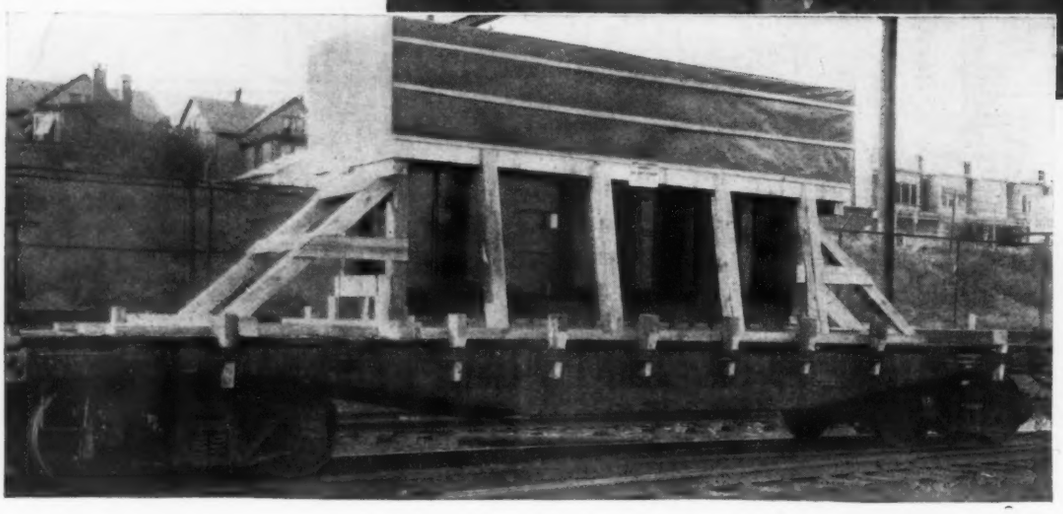
AS A manufacturer of switchgear apparatus, it sometimes seems to us that the old adage has been turned around and that the version of today is "there's nothing the same under the sun." Our typical substations seem now to be in vigorous competition with nature for the "infinite variety" prize, with a better than good chance of winning. It is interesting to think what the automobile industry would be today if we bought the engines here, the bodies there and the horns somewhere else. But more important is the realization to which we must come, that we probably couldn't afford to own one built that way.

That it is a costly matter to have so much time and talent taken up in the design of our power plants and substations is beginning to be apparent. That the apparatus designers have actually been prevented from materially contributing to simplifying arrangements, and to the combination of functions, is not so well recognized. And yet the primary engineering function is still to do for one dollar what any one can do for two, and to do with one piece of apparatus what was formerly accomplished with two, or three.

Significant of the trend which we shall either recognize or have our economists force upon us are the tendencies in design illustrated by two installations of switchgear.

The complete switchgear and control unit for a 4-kv. primary network unit is shown in Fig. 1. Built around the metal-clad idea, with the added requirement that the unit be submersible, this unit is complete with oil circuit breakers, the equivalent of gang-operated, mechanically operated disconnecting switches, instrument transformers, mechanically operated disconnecting switches, instrument transformers, control transformers, buses and a complete automatic relaying equipment, to free the equipment from the heavy carrying charges of building and grounds and the constant drain for manual supervision. Of perhaps more importance is Fig. 2, illustrating the





Figs. 1 and 2—Complete primary network unit without transformer

This requires only bolting to foundation and cable connections to be ready for service.

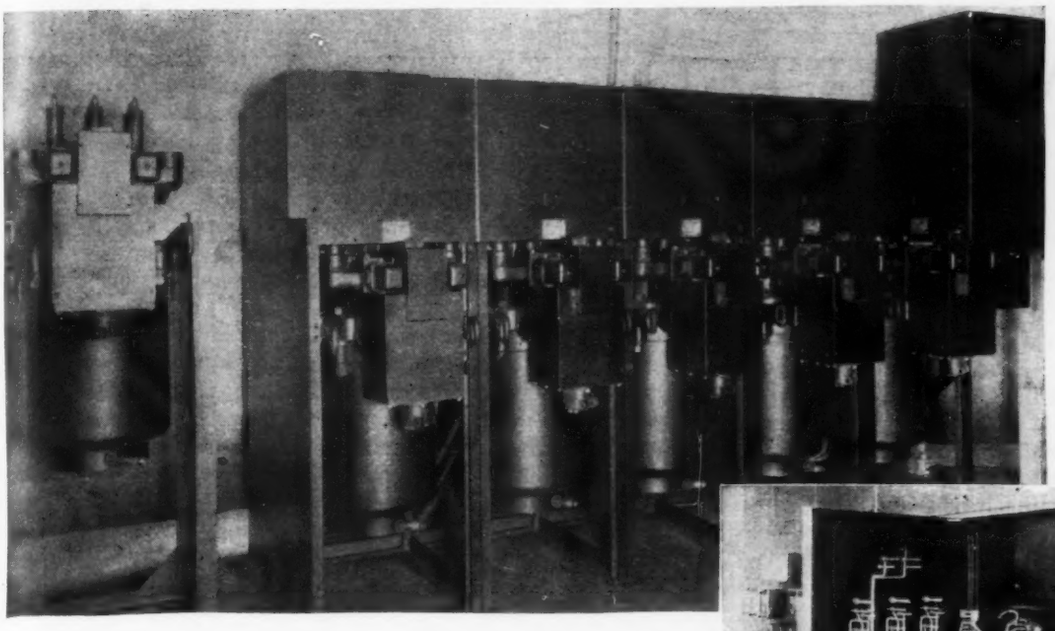
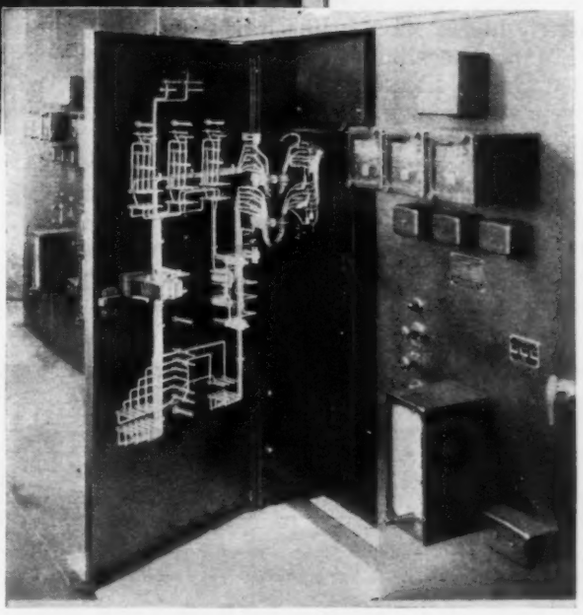


Fig. 3—A five-feeder circuit indoor switchgear

Complete with incoming line compartment and inspection rack.

Fig. 5 — Typical construction and wiring on complete metal-clad switchgear units



method of shipment of the gear, requiring only the following before placing in service:

1. Bolting unit to foundation.
2. Wiping of primary and secondary cable joints.
3. Rolling in the oil circuit breakers.
4. Closing compartments—and ready for service.

Of equal importance is the installation illustrated in Figs. 3, 4 and 5. Fig. 3 shows a five-feeder circuit indoor, metal-clad equipment (15 kv., 150,000 kva.), with incoming line compartment and inspection rack. Fig. 4 illustrates the back of this equipment, showing the application of complete manual control directly to the units. Fig. 5 shows the type of construction used for the panels and the means provided for inspection of wiring. This condensed substation is noteworthy, not only because of the drastic reduction in space required and the elimination of all conduit runs between the switchgear and panels but more for the reason that this entire switching and control substation can readily be shipped completely assembled in one piece. The only field work required is to connect the primary cables and connect the storage battery to the control bus, which is built into the gear.

Fig. 4—Rear of five-feeder circuit indoor switchgear showing complete manual control

Had standard pieces of apparatus been used throughout and these collected into such a gear, it is conservatively estimated that the bulk would have been 100 per cent greater, the safety features largely missing and group shipment would have been impossible. And such equipments as these result from the apparatus designers starting to think in terms of stations and not component apparatus. Assuming a reasonable standardization of design of station, and with inventiveness directed to simplification of functional apparatus and this coordinated with the station always in mind, a rapid decrease in station-building costs as well as decided downward price trends on the apparatus would inevitably result.

Flexible Window Lighting Aids Sales Effort

By KARL ANTON PIEZ
Boston, Mass.

WINDOW lighting development at Pawtucket, R. I., has in the past been somewhat circumscribed by the influence of the adjacent city of Providence on practice in this territory. Naturally the leading stores of the much larger community, only 4 miles distant from Pawtucket, have felt able to invest relatively higher sums in this work, and because of this Paul Manchester, illuminating engineer of the Blackstone Valley Gas & Electric Company, recently attacked the problem of obtaining a highly flexible installation without running into costs above the acceptance of merchants in the Pawtucket-Woonsocket area. An effective layout has been completed at the company's main offices, where two front windows have been equipped for day and night service on time clock control, utilizing both distributing and concentrating type reflectors with 200-watt units spaced 12 in. apart on centers in two rows along the window fronts and 150-watt units in distributing reflectors at the window ends adjacent to the building entrance.

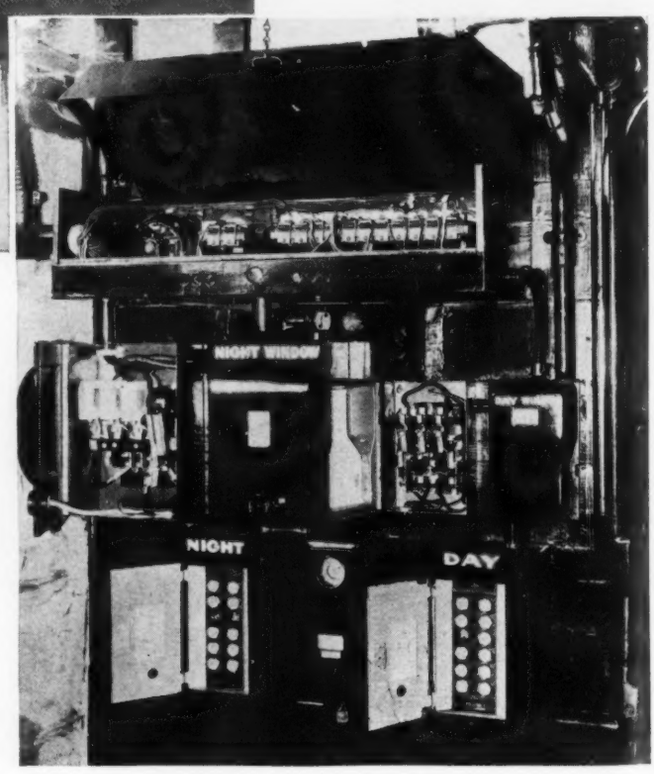
Each window is about 12 ft. long x 9 ft. high x 7 ft. deep. The bottoms of the reflectors are about 7 ft. above the floor. Along the front nearer the glass are twelve No. 500 X-ray units with louvers normal to the plane of the glass. These distributing type outfits are run on the night circuit and the distributing type end units (X-ray No. 400) are operated on both day and night circuits. The inner row of twelve units (No. 510 X-ray) is in circuit daytimes. These units are of the concentrating type with louvers parallel to the window glass. Four units are provided at the entrance end of each window and the total connected load per window is 5.4 kw., of which 3 kw. is in service constantly. The absence of glare is notable and the reflectors can be equipped with color ray facilities when desired, thus greatly increasing the flexibility of the service. The use of the louvers in no way interferes with the application of color equipment.

The reflectors are supported on "Curtistrip," which is carried by strap-iron brackets as shown. The "Curtistrip" was wired and assembled on the bench and was laid in position on the brackets without permanent fastening. The entire equipment, including reflectors, can be lifted out of place should it be desirable to reach the wiring, and can be pushed forward on the brackets. This is a useful feature in window cleaning.

The equipment in the show windows and a large electric sign which works in conjunction with these are segregated into three circuits—day, night and constant service. A Sauter astronomical time clock operates contactors so that the day circuits are used from 7 a.m. to 4:30 p.m. and the night circuits from 4:30 to 12, with an automatic variation in the 4:30 start depending on the hour of sunset. The constant-service circuit can of course be used at any time and is provided so that

Non-rigid reflector mountings make layout changes speedy and easy

Commercial motor starters control lighting feeds on time-clock schedule



electric clocks and other appliances can always be displayed and so that there will never be a time when the window need be entirely dark. The contactors are merely standard motor starters, that for the night circuit being of 25 hp. size and for the day circuit of 5 hp. rating. These are equipped with push-button control, permitting simultaneous use on special occasions. Standard motor starters were selected on account of their economical cost and availability, replacement parts being quickly to be had at any time.

Besides the lighting equipment in each window there are three convenience outlets, one each on the three circuits provided. Mounted on "Wiremold" running along with the "Curtistrip" in each window are two convenience outlets on the day circuit, three on the night and one on the constant-service circuit. The window area back of the return can be partitioned off to make a small V-shaped window when desired, which is why the end reflectors are wired to both day and night circuits. Three convenience outlets are also provided in the space opposite the return, one on each of the three segregated circuits.

The window layout was designed for the dual purpose of facilitating the company's own displays of merchandise and for demonstration of window lighting to local merchants. While the company does not expect that many of its customers are likely to use two rows of reflectors, the value of separate switching is evident. For smaller installations reflector types may be employed alternately in single rows. All the equipment employed is of conventional type, easily purchased from local sources and inexpensive both for installation and maintenance.

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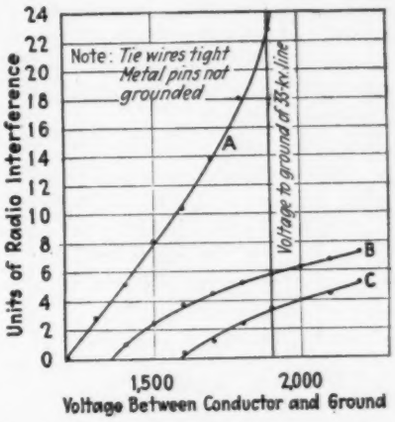
Reducing Transmission Line Radio Interference

By B. E. ELLSWORTH
Engineer Iowa-Nebraska Light & Power Company

In general, transmission lines causing radio interference operate at 33,000 volts or above between conductors and use pin-type insulators; 22,000-volt lines give trouble when iron conductors are employed. By substituting suspension insulators for pin type, the radio interference can be reduced to 20 per cent or less. This, however, is a very costly remedy. Ordinarily a line does not cause radio interference unless there is a lower voltage circuit on the same pole line. The interference is transferred from the transmission line to the lower circuits through the electrostatic capacity between lines, which is of a high value. Transformers offer very little resistance to the passage of this interference due to the high electrostatic capacity between windings (a grounded shield between windings perhaps would help). Thus the interference reaches the secondary feeders and passes to ground through the radio set, and in so doing causes the characteristic, unpleasant rasping sound.

One characteristic of this type of interference is that it almost disappears during damp or rainy weather. The reason for this is that water on the line wires, tie wires, insulators, and, in fact, on the whole pole or tower structure, bonds the metallic parts together, and as a result very little or no static discharges occur.

The accompanying curves show the results that may be obtained by the use of different pin-type insulators. The remedy shown by one curve is economical and effective. If an ordinary insulator is coated on top with aluminum paint the interference will be cut down very materially. This is due to the fact that the tie and line wires make good contact with each other and the top of the insulator through the metallic paint. Such an insulator or one with the metallic substance glazed into the insulator material will give the curve *C*. With a metallic coating on top of the insulator the tie wire continues to make good contact, even after it has been in service for some time and has corroded and worked loose on the line wire. For this reason interference on a line using this type of insulator will not increase with age.



Radio interference responsibilities of pin-type insulators

The other method of overcoming the trouble is to separate the metal pin and conductor or, in fact, do away with the pin entirely, thus producing an insulator resembling a bushing in appearance. The porcelain portion of this insulator is cylindrical, employs the fog-type petticoats and has the ordinary wire groove on top. The bottom of this porcelain is cemented into a flat iron base, which in turn is bolted onto the crossarm. Such an insulator produces the curve *B*. With this type interference will be worse when the line ages and the tie wire loosens. A metal coating on top of this type of insulator does not seem to improve the performance, doubtless due to the long distance between the line wire and metal base. Curve *A* is a typical curve of a standard 45-kv. two-piece insulator. Interference will be approximately 1.6 times the values on this curve if the tie wire is loose. Grounding the metal pins has the tendency to reduce the interference to about 60 per cent of its former value.

Insulator tests recommended

It is recommended that each power company perform tests on the insulators it uses. All the equipment necessary is a mounted insulator with a wire tied on top, which is energized with a varying voltage to ground. Any sensitive radio set with a loop aërial and with a milliammeter in the loud-speaker circuit to record the readings will be sufficient. A few precautions in making the tests might be mentioned. If a ground wire is used to ground the metal pins, be sure its location is not changed during the tests. The aërial should be placed 4 or 5 ft. below the insulator to approximate the location of a lower circuit. The ground wire (if used) should be placed some distance from the aërial. Tie wires should be made tightly to test for new line conditions or loosely to approximate an old line.

READERS' FORUM

Water Power in Its Economic Aspects

To the Editor of the ELECTRICAL WORLD:

As the writer has spent a large part of his time during recent years on studies, investigations and reports relating to the economic balance between steam and hydro capacity for large power systems, he was particularly interested in the article by George A. Orrok in your issue of December 12, entitled "Water Power in Its Economic Aspects."

The inference which any one reading this article would necessarily draw is that the development of water power under modern conditions is necessarily uneconomic in practically all cases because steam power is much cheaper. However, Mr. Orrok would hardly contend that all or most of the hydro-electric plants built in the last ten years were uneconomic.

It is unfortunate that most of the articles which have been written on this subject are written from the standpoint of the advocate of one or the other source of power who proceeds to marshal his facts to support his contentions, omitting from consideration all facts which might be considered as unfavorable to such contentions.

Under modern conditions, hydro and steam power are rarely truly competitive, but should be considered as complementary sources of power. Thus in the case of many large systems containing both steam and hydro plants in proper relation the total cost of the power supply is much less than it would be if all capacity were in steam. The relation which total hydro installation bears to the system peak is often spoken of as the "hydro ratio" and the economic hydro ratio is that which will give a minimum total cost of power supply for the given situation. Evidently the economic hydro ratio may vary all the way from 100 per cent for a situation like some parts of Canada, where coal is very expensive and desirable hydro sites abundant, down to zero for a situation where coal is cheap and hydro sites very expensive.

For certain large power systems in the United States, which the writer has had occasion to analyze, the economic hydro ratio has been determined as varying from 25 per cent in some cases up to 70 per cent in others.

Even in the case of companies so located that the installation of hydro plants is very expensive, it will usually be found that some hydro capacity in the system will cause a decrease in the total cost of power supply. This arises from the fact that although the cost of development for a given project may be high the incremental cost is usually low. Thus to install a hydro project on a stream on the basis of a 50 per cent annual capacity factor may cost $250 per kilowatt for a 100,000-kw. installation, but additional capacity may be added at $50 per kilowatt, bringing the cost for a 200,000-kw. installation (25 per cent annual capacity factor) down to $150 per kilowatt. If the system is so large that in the top 200,000 kw. of the load curve there is no more energy required than would be available at the proposed hydro plant during a week of minimum stream flow, then all this capacity is said to be firm capacity on the load curve because it is capable of performing the same function on the load curve as alternative steam capacity. Peak-load service can frequently be provided much more economically by hydro capacity having large pondage than it can be provided by steam.

In considering the diagram giving hydro generation costs shown by Mr. Orrok it should be realized that in most cases the hydro plants having the low load factors would also have low capital cost per kilowatt, as in the illustration cited above. From Mr. Orrok's illustration it would appear that the chance for an economic hydro project would be only in the case where it could be installed for a very high load factor. Actually, however, the modern tendency is exactly the opposite of this. Projects which ten or fifteen years ago would have been planted for a 60 or 70 per cent annual capacity factor are now planted on a 30 to 40 per cent capacity factor basis and installation at existing plants is being increased.

In his illustration Mr. Orrok uses 12.5 per cent fixed charges on both steam and hydro, whereas actually fixed charges are practically always less per dollar of capital investment for hydro than for steam. This is because with hydro there is a much larger part of the total investment in items having slight or no depreciation, such as lands, riparian rights and structures of earthwork and concrete. Taxes in the rural sections where hydro plants are located are also usually less. This differential in fixed charges in favor of hydro as compared with steam varies from 1.5 to 2.5 per cent, according to the proportion of total investment in items of slight depreciation.

It is unfortunate that hydro-electric power has become to some extent a political issue and it is highly desirable to point out that hydro power is far from free, and that under many conditions requirements for additional capacity can be more economically obtained by building steam plants. On the other hand, in combating propaganda often centering around schemes for government owned or controlled hydro-electric power it is easy to so overstate the facts that they fail to convince.

There has been and there is still taking place a remarkable advance in the efficiency of steam-electric power. It is true that the limit of efficiency of hydraulic turbines has very nearly been reached, but, on the other hand, this art also is progressing. The other day the writer visited a hydro-electric plant built fifteen or sixteen years ago having a capacity of 12,000 kw. The power house was about as large as that of a modern plant having an installation of 100,000 kw. and the equipment was much more extensive and complicated than would be the case today. There is still opportunity for further advance and an increase in over-all efficiency: that is, the ratio of the energy actually extracted from the water to the theoretical energy in the water has greatly increased and will continue to increase. Thus at some plants where the utilization factor was 35 per cent a few years ago it has now risen to 60 or 70 per cent.

Additional improvements in steam power generation and the introduction of additional sources of power will affect the economic hydro ratio of any particular territory, but the inherently cheap incremental cost* of additional hydro installation, low operating cost and advantage for peak service insures the continuance of the use of hydro plants for furnishing a part of the capacity requirements of our large power systems.

United Gas Improvement Company. **JOEL D. JUSTIN.**

**An analysis of a number of actual developments through a wide range of capacities and heads shows that the incremental cost of hydro installations varies from $35 to $70. (J. D. J.)*

Men of the Industry

E. S. Fitz Heads Electric Department in Richmond

E. S. Fitz has been appointed general manager of the electric department of the Virginia Electric & Power Company for the entire system which serves

tidewater Virginia and northeastern North Carolina. Prior to this assignment he was manager of production and transmission for the system and in his new position he will have charge of distribution as well. He will continue to make his headquarters in Richmond.

Mr. Fitz joined the Virginia Electric & Power Company in the latter part of 1928, removing there from Beaumont, Tex., where he was operating manager of the Eastern Texas Electric Company, the Gulf States Utilities Company and the Western Public Service Company.

Born at Harrisville, R. I., he spent his early years in that state, his alma mater being Brown University at Providence. His connection with the Stone & Webster organization began in 1911 with the Blackstone Valley Gas & Electric Company. After discharge from military service in 1919 he went with the Houghton County (Mich.) Electric Light Company and two years later with the engineering division of Stone & Webster at Boston, which duties carried him to Jamaica, West Indies, and other places until he was transferred to the Texas properties in 1924.

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J. A. Cook, electrical superintendent of the Lynn (Mass.) Gas & Electric Company, was elected chairman of the New England System Operators' Club at the recent annual meeting in Cambridge, Mass. S. C. Jacoby, superintendent of transmission and distribution, Montaup Electric Company, Fall River, Mass., was elected secretary of the organization.

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Henry H. Timken, Jr., has been made assistant to the president of the Timken Steel & Tube Company, Canton, Ohio. Mr. Timken has been serving in the capacity of assistant works manager of the Timken Roller Bearing Company for the past two years.

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W. A. Sauer Undertakes New Executive Duties

William A Sauer, who has been elected executive vice-president of the Midland United Company, as announced in the December 19 issue of the Electrical World, has a background of more than 38 years' experience in the public utility field. He was born in Chicago in 1878, and after attending public schools in that city he entered the employ of the old Lake Gas Company. He was appointed superintendent of accounts of the People's Gas Light & Coke Company in 1910; in 1920 he was elected comptroller of the company, and since 1924 he has been a vice-president.

Mr. Sauer has also been associated with the management of the Midland United Company's group of subsidiaries since 1923, and previous to his election as executive vice-president of this company he was vice-president and general manager. In addition, he is vice-presi-

dent of the Chicago, South Shore & South Bend Railroad, the Indiana Service Corporation and the Northern Indiana Public Service Company and also is an officer and director of other companies under the management of Samuel Insull and associates.

F. B. Lewis New General Manager of California Utility

Fred B. Lewis, who was appointed general manager of the Southern California Edison Company, as announced in the January 2 issue of the Electrical World, has been connected with that company for 26 years, and before his recent promotion served as vice-president and assistant general manager. He started with the company immediately after graduation from Rose Polytechnic Institute in 1905 as meter tester, and later entered the distribution department, serving successively as en-

gineer of underground distribution, superintendent of the Los Angeles district and manager of operation.

It was in 1924 that Mr. Lewis first attracted the attention of the executives of the company when he so capably performed the duties of power administrator during the water shortage of that year. Mr. Lewis had charge of coordinating plans for the exchange of power with other utilities to prevent curtailment of industry and so successful was he as an executive that when the emergency had passed the company promoted him to the position of assistant general manager. While occupying this office, Mr. Lewis showed that in addition to being a technical man, he was a financier of some ability. Devoting his attention to operating costs, he worked out a system of budgeting all operating expenses for every department of the company and this proved to be one of his outstanding accomplishments. In June, 1928, he was given the title of vice-president and assistant general manager in charge of operation.

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Ralph A. Johnson has been appointed power sales engineer of the New England Power Engineering & Service Corporation, northeastern district, with headquarters in Lowell, Mass. A native of Scarboro, Me., and a graduate of the

Massachusetts Institute of Technology, Mr. Johnson was employed from 1911 to 1918 in the meter department, stock room and generating station of the Lowell Electric Light Corporation, attaining the position of head operating engineer. He then went to Savannah, Ga., as assistant chief engineer of the Savannah Electric Company, and in 1920 joined the Westinghouse Electric & Manufacturing Company's sales staff in Boston. From 1922 to 1927 he was chief engineer of the Wood worsted mill of the American Woolen Company, later returning to the Lowell company as power sales engineer.

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GEORGE D. WOODS, vice-president of Chase Harris Forbes Corporation, has been elected a member of the board of directors of the Associated Gas & Electric Company.

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CHARLES W. HADLEY of Wheaton, Ill., who has been chairman of the Illinois Commerce Commission, resigned January 15 to accept the Republican nomination for Attorney-General of the state.

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F. L. PALMER, formerly with the purchasing department of the Cambridge Electric Light Company, has been appointed sales manager of the Lundin Electric & Machine Company, Boston.

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ALBERT LEVY, formerly connected with the sales department of the Narragansett Electric Light Company, has been appointed sales manager of the Attleboro (Mass.) Steam & Electric Company, a subsidiary of the New England Power Company.

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O. G. THURLOW, who has been closely identified with the engineering and construction work of the Alabama Power Company since 1912, recently won recognition for his services to the company, the electrical industry and the State of Alabama, when the board of directors of that utility voted to designate the hydro-electric development on the Tallapoosa River at Tallassee, Ala., as Thurlow Dam. Mr. Thurlow became designing engineer for the Alabama Company in 1912, was named chief engineer two years later with supervision over all engineering and construction activities, and in 1924 he was made vice-president in charge of engineering and a director of the company. With the formation of Allied Engineers, Inc., in 1930 he was elected a vice-president of that organization in charge of its activities in the South, and upon the dissolution of Allied Engineers last November he became affiliated with the Commonwealth & Southern Corporation. He was awarded the Potts medal by the Franklin Institute a few years ago.

M. D. Field New Vice-President of Western Utility

M. D. Field, who was elected vice-president and treasurer of the California Oregon Power Company, as announced in the December 5 issue of the ELECTRICAL WORLD, had a broad background of experience in general business before entering the public utility industry.

A native of Vermont, he removed at the age of seventeen to Albuquerque, N. M., where he entered the employ of the First National Bank. Then he engaged in various business enterprises and at the same time succeeded in getting approximately two years of college work in the University of New Mexico.

In 1908 he entered on about ten years' experience in construction with the Grant Brothers Construction Company, railroad contractors, and the J. G. White Company of New York on the construction of several hydro-electric projects, holding various positions from timekeeper to construction superintendent, most of the time as construction accountant. Following this experience he was transferred to the San Francisco office of the J. G. White Company, where his time was given almost exclusively to valuation work and financial investigations for public utility clients.

At the time the J. G. White Company closed its Pacific Coast office he entered the employ of the Pacific Gas & Electric Company, and for the past twelve or thirteen years has been employed in public utilities accounting work, the past eight years of which have been with the California Oregon Power Company.

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HAROLD G. JENKS, for seven years superintendent of the Eastern Massachusetts Electric Company, Salem, Mass., and formerly assistant superintendent of the Cambridge (Mass.) Electric Light Company, has been appointed New England sales representative of the R. G. Haskins Company of Chicago, maker of flexible shaft motor-driven abrasive machinery. His headquarters will be in Watertown, Mass.

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OBITUARY

NIEL A. WEATHERS, chairman of the board of the United Electric Securities Company, which is affiliated with the General Electric Company, died January 12 at the Montclair Hospital, Montclair, N. J., in his fifty-sixth year. He had suffered from heart disease for almost a year. A graduate of Amherst College, Mr. Weathers was engaged for four years in business before entering the Law School of Columbia University, from which institution he received his degree in 1905. He began to practice law with Simpson, Thacher & Bartlett in 1905, became a member of the firm in 1913 and left it 1928 to become chairman of the United Electric Securities Company. At the time of his death Mr. Weathers was a director of the American & Foreign Power Company, Italian Superpower Company, European Electric Corporation, Iberian Electric Company and Eastern Michigan Railways.

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CHARLES E. WIGGIN, a well-known member of the electrical industry in the West, and until his retirement two years ago very active in its affairs, died January 5. Mr. Wiggin had been associated with the electrical industry for about 25 years. He began his career in San Francisco in 1904 with Will & Fink, electrical contractors, and in that association he was engaged in construction work of all kinds. Later he served for several years as secretary of the San Francisco Electrical Contractors' Association. His next step took him to the Western Electric Company, where he was employed as chief clerk in its San Francisco office. Subsequent connections were with the John R. Cole Company, manufacturers' agent, and Dunham, Carrigan & Hayden Company, a wholesale jobbing house. He joined the sales department of the Pacific States Electric Company, now the General Electric Supply Corporation in 1923, remaining until January 1, 1930, when he retired from active business. He continued to maintain his interest in the industry, however, and rarely missed a meeting of the San Francisco Electrical Development League. He was a past-chairman of the National Electrical Wholesalers' Association, having served in that capacity in 1922.

Trade News

Allis-Chalmers Buys Ryan Manufacturing

Announcement is made that the Allis-Chalmers Manufacturing Company has purchased for cash the Ryan Manufacturing Company of Chicago and will add its line of graders of the plant at Hegewisch, Ill., to the production concentrated at the Advance-Rumely factory at La Porte, Ind. This gives Allis-Chalmers a complete line of road machinery, besides its tractor production.

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General Electric Subsidiary Reduces Capitalization

Capitalization of the Electric Securities Corporation, General Electric's investment unit, has been reduced from $42,500,000 to $23,750,000. This was made possible by the surrender of common stock on the part of the parent company, owner of all the common and a majority of the preferred stock of the subsidiary.

Last April Electric Securities Corporation increased its capital by adding 150,000 preferred and 400,000 common shares. This gave General Electric Company 1,000,000 common and 250,000 preferred shares, for which that company paid $25 for common and $100 for preferred stock. Thus the stock capitalization was increased by $20,000,000. The corporation invested heavily in utility securities.

It may be assumed that the transaction provides for the writing off of losses suffered during the year. It is understood that a substantial volume of securities was sold early in 1931, but subsequent purchases exceeded the total of securities sold.

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Combustion Engineering Corporation, New York, announces that J. D. Harrison, district manager of the Chicago office from 1922 to 1929, has been reappointed to that position effective January 1, with offices in the Bankers' Building, Adams and Clark Streets. Mr. Harrison will succeed Hugh R. Carr, who has been appointed manager of stoker sales at the home office in New York.

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A contract for nine 1,000-hp., 1,200-r.p.m. and three 900-hp., 1,200-r.p.m. synchronous motors and their control was recently awarded Electric Machinery Manufacturing Company, Minneapolis, Minn., by the city of San Francisco. The motors will be used to drive high-head centrifugal pumps on the Coral hollow pipe line of the Hetch Hetchy water project.

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Arrow-Hart & Hegeman Electric Company of Hartford, manufacturer of electric wiring and switch devices, is establishing a branch plant in Toronto, Canada, immediately.

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Parker Electrical Manufacturing Company has announced the opening of a branch office and warehouse at 66 Turk Street, San Francisco, Calif., for the distribution of electric panels and switchboards in San Francisco.

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F. L. PALMER, formerly with the purchasing department of the Cambridge Electric Light Company, has been appointed sales manager of the Lundin Electric & Machine Company, Boston.

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Corning Glass Works announces the appointment of the W. L. Rose Equipment Company, with offices in St. Louis, Mo., as its agent for the sale of "Pyrex" power insulators, covering the southern part of Illinois, eastern part of Missouri, eastern part of Arkansas and the western part of Tennessee. The Bra Bon Electric Company, Inc., with offices in Philadelphia, Pa., has been appointed agent for the sale of the same product in the southern half of New Jersey, eastern half of Pennsylvania, eastern half of Maryland, the District of Columbia, and the states of Delaware and Virginia.

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Kelvinator of Canada, Ltd., announced recently a contract whereby it will engage in the manufacture and sale in Canada of "Electrochef" electric ranges, according to a statement by F. S. McNeal, general manager.

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Last year saw sales of General Electric refrigerators approximate sales for 1930, the best year in the company's history. The 1930 sales were almost 30 per cent ahead of those for 1929.

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Announcement has been made of a further consolidation of the resources and facilities of the Babcock & Wilcox and the Fuller Lehigh organizations. The sales offices of the two companies have been combined and all business heretofore carried on separately or jointly by these companies will be done in the name of the Babcock & Wilcox Company through its district sales offices.

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The 1932 commercial edition of the Holophane catalog, No. 375-J, has been issued. This booklet contains the new developments for 1932, including units for psychiatric lighting and jail cells flush wall night lights and flush wall indirect lights, artificial sunlight units for use in general lighting on regular circuits and outlets, a new 16-in. filterlite with internal hanger, new substation unit and aviation boundary lights.

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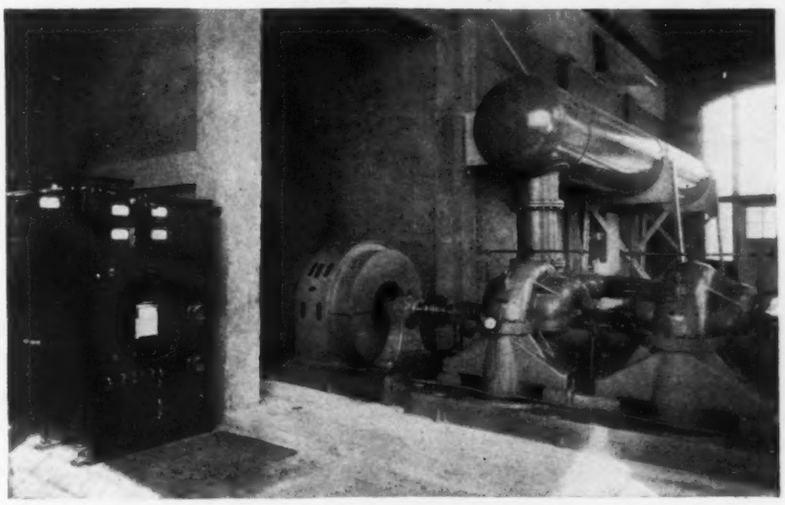
PUMP MOTOR WITH PART-WINDING STARTING METHOD



New part-winding starting method for alternating-current motors developed by the Electric Machinery Manufacturing Company, Minneapolis, for use in pump installations. The synchronous motor shown in the illustration is rated 1,250 hp., 1,200 r.p.m., and drives a high-head centrifugal pump at the East Bay Municipal Utility District, Oakland, Cal.

New Equipment Available

Duplex Flush Receptacle

A duplex flush receptacle the contact design of which is new and unique in that the contact pressure is supplied by an auxiliary steel spring which carries no current has been announced by Cutler-Hammer, Inc., Milwaukee, Wis. The spring will not overheat, so the contacts will always retain their original "set." Bakelite back-up lugs keep contacts in alignment. It is impossible to "rock-off" the cap or damage or distort the contacts, it is claimed. In addition, the contacts are designed so that the point of arc is at the flared lip, keeping the contact area of the clip proper free from burning and pitting.

The body is of molded bakelite. It has a new patented finding ring which permits easy insertion of the cap blades by means of a slight clockwise turn. The receptacle is rated 15 amp., 125 volts; 10 amp., 250 volts.

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Refractory-Protected Mercury Switch

A new refractory-protected mercury switch which should be of special interest to equipment and device manufacturers has been announced by the Westinghouse Electric & Manufacturing Company. To protect the glass walls of this switch a refractory block is placed within the switch, providing a chamber to confine the arc caused by the opening and closing of circuits having surge characteristics. The refractory-protecting chamber is so designed as to insure a positive, safe and dependable impact contact between two pools of chemically pure mercury. The ease with which this switch may be mounted and assembled and the comparatively small amount of energy necessary to operate it are among its notable advantages.

A few of the many uses of this switch are for temperature regulators, motor controls, sign flashers, lighting controls, time clocks, heating controls, signals and gasoline pumps.

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HIGHER SPEED SPOT WELDING is now obtainable with a new series of welding machines which enable the operator to make from 30 to 100 welds per minute in graduated steps. These units, made possible by a new motor drive with variable-speed reduction-geared heads, are announced by the Eisler Electric Corporation, Newark, N. J. A variable current regulator controls the heat of the weld, while the pressure is adjusted by a pressure nut. The timing is automatic and is maintained uniform at all speeds. The series "M" ranges in six sizes, $\frac{1}{2}$, 1, 3, 5, 10, 20 and 35 kva., and will weld from 0.0005 to $\frac{5}{8}$ in. combined thickness.

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Electronic Meters for Micro-Milli Values Upward

Indicating instruments with vacuum tube amplification for measuring extremely low values and upward of alternating current and voltage are announced by the Rawson Electrical Instrument Company, Cambridge, Mass.

The new line is useful in communication, television and photophone laboratories and in power engineering in connection with insulation, carrier current and other measurements. The type is portable and compact, weighing but 17 lb. maximum in the case of microammeters with full-scale ranges of 60 to 1,000 microamperes and 1 to 1,000 milliamperes. Vacuum tube amplification is employed. Calibration is from full scale to 20 per cent of this value. The milli-voltmeters range in full-scale calibrations from 60 millivolts to 1,000 volts. Both voltage and current readings may be obtained from single instruments in the so-called multimeter type. The micro- and milli-ammeters are designed to withstand overloads of 500 per cent and considerably higher surges, and overloading to the extent of 500 per cent on millivolt ranges to 50 per cent on ranges above 100 volts can be sustained by the voltmeter line. In general, the instruments may be used on frequencies ranging from 25 to 10,000 cycles, the multimeter being adapted to 100,000 cycles or less, with twenty ranges from 60 to 1,000,000 microamperes.

Induction Furnace Handles Non-Metallic Material

Enlargement of the sphere of application for high-frequency, coreless induction furnaces, through modifications in design which permits the keeping molten of non-metallic charges without the destruction of the refractory linings of the furnace, is announced by the Ajax Electrothermic Corporation. In the standard Ajax-Northrup furnace a helix of water-cooled copper tubing forms the primary circuit. The charge or melt contained within the refractory crucible or lining acts as a secondary which supplies the heat required for melting.

Obstacles to the keeping molten of such non-metallic, conducting (when liquid) materials as Fe_3O_4 have been the destruction of almost all refractory linings upon contact with the molten oxide. To obviate this difficulty, linings of rammed granular iron oxide are now used and cooling coils, not connected to the electrical circuits, assist in cooling the lining and keeping it intact. The same method is said to be applicable to other non-metallic materials which conduct electricity when in the molten state. It is necessary, however, that the primary coil be placed above the melt rather than around it.

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Electric Space Heaters of Aluminum Fin Type

A new form of electric space heater with concealed heating elements cast in an aluminum fin-type grid has been announced by the heating division of the American Foundry Equipment Company, Mishawaka, Ind. The unit heaters consist of the heating element and a blower and are suitable for any general space heating use. Capacities range in fifteen steps from 1.2 kw. to 60 kw., with receptive B.t.u. and air volume circulation for such sizes of 4.098 to 204,900 B.t.u. and 85 to 3,400 cu.ft. per minute.

Advantages of the concealed fin-type grid design are said to be in the greatly increased radiating areas of the cast-in elements, permitting large heat capacities to be built in relatively small unit heaters with operation at low temperatures. The cast-in grids are said to be virtually indestructible.

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AN ELECTRIC SIGNAL DEVICE for use with the control valve on the Copes feed water regulator has been announced by the Northern Equipment Company, Erie, Pa. It gives instant warning of any abnormal condition in the boiler feed supply by signaling by means of a bell or an electric light if the valve should ever reach the wide-open or fully closed positions.